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PROPOSAL,

CONTRACT, BOND AND SPECIFICATIONS

FOR CONSTRUCTING

SEWERAGE SYSTEM IMPROVEMENTS

CONTRACT "A"

FOR

THE CITY OF ATHENS, GEORGIA

RALPH M. SNOW, MAYOR

CITY COUNCIL

C. S. Denney	Walter N. Danner
Luther T. Bond	R. W. Phillips
Guy W. Smith	Allen H. Briscoe
J. Comer Whitehead	Lee H. Guest
W. C. Hartman	H. H. Giles

J. G. Beacham
CITY ENGINEER

WIEDEMAN AND SINGLETON
ENGINEERS
ATLANTA, GEORGIA

July, 1960

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ADVERTISEMENT FOR BIDS

Sealed proposals will be received by the City of Athens, Georgia in the office of the City Clerk in the City Hall until 2:30 P.M., E.S.T., October 25, 1960, for constructing Sewerage System Improvements, Contract "A", at which time they will be publicly opened and read in the Council Chamber of the City Hall.

The work includes the following approximate quantities:

DIVISION ONE: A 5.0 million gallon per day trickling filter type Sewage Treatment Plant and Chlorine Building and all appurtenances.

DIVISION TWO: 810' of 8", 910' of 10", 4605' of 12", 160' of 15", 4150' of 18", 1680' of 21", 740' of 24", 1945' of 30", 5070' of 42" clay or concrete sewers:
342' of 10", 80' of 12", 32' of 16", 10' of 18", 176' of 20", 48' of 30", 176' of 42", cast iron mechanical joint sewers:
120' of 16", 464' of 20" ductile iron mechanical joint sewers and other appurtenances.

Bids may be made on either or both of the two divisions into which the work is divided.

Plans, Specifications and Contract Documents are open to public inspection at the office of the Engineer Director, or may be obtained from Wiedeman and Singleton, Engineers, P. O. Box 1878, Atlanta 1, Georgia, upon deposit of:

$60.00 for Division One
$25.00 for Division Two
$75.00 for Division One and Division Two

Upon the return of all documents in good condition within thirty (30) days after the date of opening of bids, one-half of the above amount of deposits will be refunded. One-half of the amount deposited will be returned to successful bidder.

Bids must be accompanied by a certified check or bid bond in an amount equal to ten (10%) per cent of the bid.

A contract performance bond and a payment bond, each in an amount equal to one hundred (100%) per cent of the contract amount will be required.

No bids may be withdrawn for a period of sixty (60) days after the closing time scheduled for the receipt of bids.

The City reserves the right to reject any or all bids and to waive informalities.

THE CITY OF ATHENS, GEORGIA

By Ralph M. Snow
Mayor

INSTRUCTIONS TO BIDDERS
AND
SPECIAL PROVISIONS

1. Intention: It is intended that the Instructions to Bidders and Special Provisions, General Conditions and Detail Specifications shall cover the complete work to which they relate.

2. Definitions: Where the following words, or the pronouns used in their stead occur herein, they shall have the following meaning:

"Owner" shall mean the City of Athens, Georgia, party of the first part to the following agreement, or its authorized and legal representatives.

"Engineer" shall mean Wiedeman and Singleton, Engineers, of Atlanta, Georgia, acting for the City or other representative duly authorized by them.

"Contractor" shall mean the party of the second part to the following agreement, or the legal authorized representatives of such party.

3. Work to be Done: The work to be done consists of furnishing all materials, labor and equipment for the construction of Sewerage System Improvements, including Interceptor and Trunk Sewers, Sewage Treatment Plant and Chlorine Building, all as set forth in the "Proposal" form, as shown on the drawings and as specified.

4. Materials and Work by Owner: The Owner will furnish no materials and perform no labor for construction of work under this contract.

5. Site Examination: The bidder is expected and requested to examine the location of the work and to inform himself fully as to the structural and mechanical conditions; the conformation of the ground; the character, quality and quantity of the materials to be encountered; the character of equipment and facilities needed preliminary to and during the prosecution of the work; the general and local conditions and all other matters which can in any way affect the work to be done under the contract.

A subsurface investigation of the underlying soils of the Sewage Treatment Plant Site was made during the month of May, 1960. Copies of the report of the subsurface investigation are on file at the office of the City Engineer, Athens, Georgia, and at the office of the Engineer, Atlanta, Georgia, and may be examined by the Bidder at either place of filing. A copy of the subsurface investigation report will be furnished to the Bidder upon written request.

The detailed information of the said subsurface investigation report are offered as information only. Neither the Owner nor the Engineer will be responsible for subsurface conditions to be found otherwise.

6. Major Items of Mechanical and Electrical Equipment: In the detail specifications the names of various manufacturers are listed under each item of equipment. The order of grouping or listing of these names does not constitute nor infer a preference. One or more of these names (see detail specifications)

are required to be listed with bid price on the proposal forms. Where more than one name is required use the lowest price for the base bid.

7. Alternate Equipment: The Bidder, at his option, may offer alternate equipment for any item of major equipment with the bid price for the item of alternate equipment in the spaces provided in the proposal under the heading "Alternate Equipment." The offering of alternate equipment shall be in accordance with the requirements of the section "Mechanical Equipment" and other applicable sections of these specifications.

8. Proposals: All proposals must be made upon the proposal form included herein and shall be for materials and work shown on the drawings and/or specified. Proposals are to be enclosed in a sealed envelope, addressed to the "City of Athens, Georgia," and marked "Proposal for Constructing Sewerage System Improvements." Bid prices must be stated for each item in the proposal.

9. Bonds: Each Proposal must be accompanied by a certified check or by a bid bond for an amount equal to at least 10% of the amount of the bid, to guarantee that the successful bidder will, within ten (10) days from the date of the notice of award of contract, enter into a contract with the Owner, and execute to said Owner a performance bond and payment bond, the said contract and bonds to be in the form set forth in the Contract, Bond and Specifications referred to in said Advertisement for Bids. If for any reason whatever, the bidder withdraws from the competition after opening the bids, or refuses to execute the required contract, performance and payment bond, if his bid is accepted, the Owner may retain the amount of the certified check, or proceed on the bid bond. The surety on the contract performance bond and payment bond shall be a surety company authorized to do business in the State of Georgia and shall be subject to approval by the Attorney for the Owner.

10. Bids Opened in Public: Bidders are requested to be present at the opening of Proposals, which will be in public.

11. Right to Reject Bids: The Owner reserves the right to reject any or all bids and to waive informalities. No bids will be received after the time set for opening Proposals. Any unauthorized conditions, limitations or provisos attached to the Proposal, except as provided herein, will render it informal and may cause its rejection. Unbalanced bids will be subject to rejection. Any bidder may withdraw his bid, either personally or by telegraphic or written request, at any time prior to the scheduled closing time for receipt of bids.

12. Determination of Low Bid: The contract will be awarded, if it is awarded, to the lowest responsible bidder or bidders. The Owner will decide which is the lowest responsible bidder, and in determining such bidder, the following elements are to be considered: Whether the bidder involved (a) maintains a permanent place of business; (b) has adequate plant equipment to do the work properly and expeditously; (c) has a suitable finanacial status to meet obligations incident to the work; and (d) has appropriate technical experience. In addition to the above considerations, the following stiuplations shall govern the determination of the low bid:

(a) Selection of Equipment: The Owner has the right to accept the price bid on any material specified as an alternate, and on which a bid is required, as a basis for award of contract.

(b) Alternate Equipment: If one or more items of alternate equipment are

approved by the Engineer and accepted by the Owner at the price bid under "Alternate Equipment," the amount of any Proposal may be adjusted at the option of the Owner by the difference between the base bid amounts for "specified" amd "alternate" brands of equipment, as a basis for award of contract.

(c) Deductions: The Owner has the right to apply any or all of the "Deductions" listed in the Proposal for the purpose of making an award.

13. Return of Checks: The Owner will, within ten (10) days following the opening of Bids, return the certified check or bid bond of all bidders, except the checks or bonds posted by the three lowest bidders, and upon the final award and execution of contract the remaining checks or bonds will be promptly returned.

14. Interpretation of Plans and Specifications: If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications, or other proposed contract documents, or as to the scope of any part of the work, he shall submit to the Engineers a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery in ample time for an interpretation to be issued before the letting date. Any interpretation of the proposed documents will be made only by Addendum duly issued and a copy of such Addendum will be mailed or delivered to each person receiving a set of such documents. The Engineers will not be responsible for any other interpretations of the proposed documents.

15. Complete Work Required: The specifications, the plans and all supplementary documents are essential parts of the Contract, and requirements occurring in one are as binding as though occurring in all. They are intended to be cooperative, to describe and provide for a complete work. In case of discrepancy in the plans, figured dimensions shall govern. In case of omissions from the specifications as to items of equipment and materials or quantities therefor, the plans shall govern. It shall be the responsibility of the bidder to call to the attention of the Engineer obvious omissions of such magnitude as to affect the strength, adequacy, function, completeness, or cost of any part of the work in ample time for amendment by addendum prior to letting date.

16. Plans: The character and location of the work, together with the essential details, are shown upon a set of drawings, entitled:

City of Athens, Georgia
Sewerage System Improvements
Dated July, 1960
Contract "A"

The drawings and the specifications shall form a part of the contract for the work. The approved plans will be supplemented by such working drawings as are necessary. All authorized alterations affecting the requirements and information given on the approved plans shall be in writing.

17. Working Drawings: Working drawings shall consist of such detail drawings as may be required for prosecution of the work but not included in the contract drawings. All necessary working drawings shall be furnished by the Contractor. Working drawings shall include shop details, masonry layout diagrams, bending

diagrams for reinforcing steel, piping layouts, electrical layouts and all other such working drawings as may be required by the Specifications, and as necessary for successful completion of the work. Approval by the Engineer must be obtained before any work involving these drawings may be performed.

(a) Check by Contractor: The Contractor shall check all shop drawings and working drawings for accuracy of dimensions and details, and for conformance with contract drawings and specifications, before submitting such drawings to the Engineer for approval. The Contractor shall indicate that shop and working drawings have been checked as outlined shown by an appropriate stamp or notation on the face of the drawings.

(b) Responsibility for Accuracy: Approval by the Engineer of the Contractor's working drawings does not relieve the Contractor for accuracy of dimensions and details. The Contractor shall be responsible for agreement and conformity of these working drawings with the contract drawings and specifications.

(c) Payment: The contract price shall include the cost of furnishing all working drawings, and the Contractor shall be allowed no extra compensation for furnishing such working drawings.

18. Cooperation of Contractor: The Contractor will be supplied with five (5) copies of the Plans and Specifications. The Contractor shall have available on the work, at all times, one (1) copy of each of said Plans and Specifications. He shall give the work the constant attention necessary to facilitate the progress thereof and shall cooperate with the Engineer and with other Contractors in every way possible. The Contractor shall at all times have a Superintendent, satisfactory to the Engineer, capable of acting as his agent on the work, who shall receive instructions from the Engineer or his authorized representatives. The Superintendent shall have full authority to execute the orders or directions of the Engineer without delay and to promptly supply such materials, tools, plant equipment and labor as may be required.

19. Construction Stakes: Subsidiary lines and grades shall be laid out by the Contractor from the controlling lines and bench marks furnished by the Engineer or from measurements shown on the drawings. All lines and grades shall be subject to checking by the Engineer, but this checking shall in no wise relieve the Contractor from responsibility for their correctness. The Contractor shall provide such stakes, materials, and such labor and assistance as the Engineer may require in laying out work, establishing bench marks and checking and measuring the work.

20. Authority and Duties of Inspector: Inspectors shall be authorized to inspect all work done and all materials furnished, including preparation, fabrication and manufacture of the materials to be used. The Inspector shall not be authorized to alter or waive any requirement of the Specifications. He shall call the attention of the Contractor to any failure of work or materials to conform to the Specifications and Contract. He may reject materials or suspend the work until any questions at issue can be referred to and decided by the Engineer. The presence of the Inspector shall in no wise lessen the responsibility of the Contractor.

21. Inspection: The Contractor shall furnish the Engineer with every reasonable facility for ascertaining whether or not the work performed and materials used are in accordance with the requirements and intent of the

Specifications and Contract. No work shall be done or materials used without suitable supervision or inspection by the Engineer or his representative. Failure to reject any defective work or materials shall not in any way prevent later rejection when such defect is discovered, or obligate the Owner to final acceptance.

22. Rejection of Work and Materials: All materials furnished and work done when not in accordance with the Specifications and Contract, will be rejected and shall immediately be removed and other work done and materials furnished in accordance therewith. If the Contractor fails to remove the work and materials as above ordered, within forty-eight hours, then the Engineer shall have the right and authority to stop the Contractor and his work at once and to supply men and material at the cost and expense of the Contractor to remove said work and materials.

23. Defective Work and Material: The inspection of the work shall not relieve the Contractor of any of his obligations to fulfill his contract and defective work shall be made good, notwithstanding that such work and materials have been previously inspected by the Engineer and accepted or estimated for payment. The failure of the Engineer to condemn improper materials or workmanship shall not be considered as a waiver of any defect which may be discovered later, or as preventing the Owner at any time subsequently from recovering damages for work actually defective. All work shall be guaranteed against defects in workmanship or material for a period of one year.

24. Corrections: Should any portion of the Plans and Specifications be obscure or in dispute, they shall be referred to the Engineer and he shall decide as to the true meaning and intent. He shall also have the right to correct any errors or omissions at any time when such corrections are necessary for the proper fulfillment of said Plans and Specifications.

25. Disagreement: Should any disagreement or difference arise as to the estimate, quantities or classifications or as to the meaning of the drawings or specifications, on any point concerning the character, acceptability and nature of the several kinds of work, any materials and construction thereof, the decisions of the Engineer shall be final and conclusive and binding upon all parties to the contract.

26. Weather: During unseasonable weather, all work must stop when the Engineer so directs and all work must be suitably protected.

27. Right-of-Way: For Division One, the necessary land for the construction of the work will be furnished by the Owner, and a definite area will be allocated to the Contractor for storage of material and equipment used in the construction of the work. All operation shall be confined to the assigned area. For Division Two, the Contractor shall confine his activities to twenty-five (25) feet on each side of the centerline of the sewer unless otherwise indicated on the Plans. The Owner will provide no right-of-way over other property. The Contractor shall take every possible precaution to inconvenience as little as possible the owners or tenants of adjacent property. Public highways shall not be obstructed in such a way as to cut off traffic. The Contractor shall, at his own expense, repair any damage or injury to either public or private property during the progress of the work. Wholesale cutting of trees on right-of-way will not be permitted as necessary for construction.

28. Competent Labor: The Contractor shall employ only competent and skilled men on the work. The Contractor shall have a competent Superintendent or

Foreman present at all times when the work is in progress with authority to receive orders and execute the work.

The Contractor shall, upon demand from the Engineer, immediately remove any Superintendent, Foreman or workman whom the Engineer may consider incompetent or undesirable.

29. Laws and Regulations: The Contractor shall keep himself fully informed of all laws, ordinances and regulations of State, City and County in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same. If any discrepancy or inconsistency should be discovered in this contract, or in the Drawings or Specifications herein referred to, in relation to any such law, ordinance, regulation, order or decree, he shall forthwith report the same in writing to the Owner. He shall at all times, himself observe and comply with all such existing and future laws, ordinances and regulations, and shall protect and indemnify the Owner and its agents against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself or by his employees.

30. Protective Works: The Contractor shall furnish and install all necessary temporary works for the protection of the work, including barricades, warning signs, and lights at night.

31. Safety Regulations: The performance of work under this contract shall comply with safety regulations prescribed by the Owner. Each bidder shall satisfy himself as to the character and extent of such regulations.

32. Sanitary Regulations: Necessary sanitary conveniences for the use of the laborers on the work shall be erected and maintained by the Contractor, in such a manner and at such points as shall be approved by the Engineer. Their use shall be strictly enforced.

33. Shanties: Should the Contractor so desire, he may build shanties or other structures for housing, tools, machinery and supplies, but they will be permitted only at approved places, and their surroundings shall be maintained at all times in a sanitary and satisfactory manner. On or before the completion of the work, all such structures shall be removed, together with all rubbish and trash, at the expense of the Contractor.

34. Office Space and Facilities for Inspectors: The Contractor shall furnish proper and adequate office space and facilities for the use of the resident engineer and inspectors. A room shall be provided at least 12' x 14' either in connection with the Contractor's office or in a separate structure, equipped with lights, heat, telephone, a suitable table, and a bench of suitable height.

35. Water Supply: The Contractor for Division Two shall make his own arrangements for water supply and for conducting water to his construction operations. The Contractor for Division One shall extend the water main into the plant site and install water meters as shown on the plans. All water used by the Contractor shall be metered and paid for by the Contractor in accordance with the City's rates. Water meters shall be City Std. and they shall be installed by the Contractor.

36. Access Roads: Streets, roads and drives used by the Contractor for access to and from the site of his work shall be protected from damage in excess of

that caused by the normal traffic of vehicles used for or in connection with construction work. Any such damage done shall be repaired immediately and left in good condition at the end of the construction period.

37. Extra Work Items in Proposal: The Proposal contains certain unit price items entitled "Extra Work if Ordered by Engineer." In each such item the estimated quantity is based upon the average amount of extra work encountered in a typical job. The stated quantities are not guaranteed but are included in the Proposal in order to determine in advance of construction the actual low bidder. No work included in such item will be approved for payment without advance authorization by the Engineer.

38. Order of Work: The prosecution, order or sequence of the work shall be as provided herein or as approved by the Engineer, which approval, however, shall in no way affect the responsibility of the Contractor.

39. Allowable Time for Completion: The time allowed for completion of all work to be done under this contract shall begin after notification by the Engineer to proceed with the work. Such notification will be issued upon completion of the contract agreements, and in accordance with approved construction schedule, arranged to be within the contract time for completion. The time allowed for completion of each division is as follows:

Division One: 540 consecutive calendar days

Division Two: 450 consecutive calendar days

40. Liquidated Damages: The Contractor shall pay to the Owner as liquidated damages the sum of forty dollars ($40.00) for each calendar day that he shall be in default of completing the work in his contract within the time limit named therein.

PROPOSAL

TO THE CITY OF ATHENS
ATHENS, GEORGIA

Submitted:________________________19___

The undersigned, as Bidder, hereby declares that the only person or persons interested in the Proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this Proposal or in the Contract to be entered into; that this Proposal is made without connection with any other person, company or parties making a bid or Proposal; and that it is in all respects fair and in good faith without collusion or fraud.

The Bidder further declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the Specifications for the work and contractural documents relative thereto, and has read all Special Provisions and General Conditions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed.

The Bidder proposes and agrees, if this Proposal is accepted, to contract with the City of Athens, Georgia in the form of contract specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary and to complete the construction of the work in full and complete accordance with the shown, noted, described, and reasonably intended requirements of the Specifications and Contract Documents to the full and entire satisfaction of the Commissioners with a definite understanding that no money will be allowed for extra work except as set forth in the attached General Conditions and Contract Documents, for the following prices:

DIVISION ONE

SEWAGE TREATMENT PLANT

SECTION I: CONSTRUCTION

Item 1 - Constructing Sewage Treatment Plant: For furnishing all materials (except Major Mechanical and Electrical Equipment listed in Section II and Extra Work listed in Section III) and equipment, and performing all labor necessary for constructing the Sewage Treatment Plant and Chlorine Building complete, including clearing, excavating, backfill grading, roadways, substructures, superstructures, sewer pipe and other piping, water supply, electrical work, painting and all other work and appurtenances necessary for completion of work under this contract as shown on the drawings and/or specified; the amount of $____________________.

SECTION II: MAJOR MECHANICAL AND ELECTRICAL EQUIPMENT: For furnishing and installing the following major items of mechanical and electrical equipment: (The Bidder must submit prices on various makes of equipment as specified under detail specifications for each item of equipment.) Use lowest price for base bid.

Item No.	Description	Price	Base Bid
2.	Screen Equipment		
	Make ________________________		$__________
3.	Grit Removal (Alternate make may be bid on P-6)		
	Make Chicago Pump Company		$__________
4.	Sludge Collectors		
	Make ________________________	$__________	
	Make ________________________	$__________	
	Make ________________________		$__________

Item No.	Description	Price	Base Bid
5.	Butterfly Valves		
	Make ________________________________		$ __________
6.	Plug Valves (Indicate Type)		
	(Lub.) (Non-Lub.) Make ________________	$ __________	
	(Lub.) (Non-Lub.) Make ________________		$ __________
7.	Gate Valves		
	Make ________________________________		$ __________
8.	Rotary Distributor		
	Make ________________________________	$ __________	
	Make ________________________________	$ __________	
	Make ________________________________		$ __________
9.	Centrifugal Pumps		
	Make ________________________________	$ __________	
	Make ________________________________	$ __________	
	Make ________________________________		$ __________
10.	Plunger Sludge Pumps		
	Make ________________________________	$ __________	
	Make ________________________________	$ __________	
	Make ________________________________		$ __________
11.	Digester Covers (Including provisions for future gas recirculation systems)		
	Make (a) ____________________________	$ __________	
	Make (b) ____________________________	$ __________	
	Make (c) ____________________________		$ __________
12.	Miscellaneous Digester Equipment (Supernatant Selector, Sampling Sink, Guage Board, etc.)		
	Make ________________________________	$ __________	
	Make ________________________________	$ __________	
	Make ________________________________		$ __________

Item No.	Description	Price	Base Bid
13.	Digester Heaters		
	Make ________________	$________	
	Make ________________	$________	
	Make ________________		$________
14.	Digester Gas Equipment		
	Make ________________	$________	
	Make ________________		$________
15.	Chlorination Equipment		
	Make ________________		$________
16.	Instrumentation and Control		
	Make ________________		$________
17.	Electrical Control Centers and Control Equipment		
	Make ________________		$________
18.	Laboratory Equipment		
	Make ________________		$________
19.	Pneumatic Controls for Raw Sewage Pumps (Alternate make may be bid on P-6) Make Autocon		$________

Sub-Total, Section II, Items 2 to 19, Inclusive $________

SECTION III: EXTRA WORK, IF ORDERED BY ENGINEER

(To cover authorized changes in scope of lump sum work in Section I and Section II.)

Item No.	Approx. Quantity	Unit	Description	Unit Price	Total Amount
20.			Excavation and Backfill		
(a)	150	Cu.Yd.	Structure, Unclassified	$________	$________
(b)	150	Cu.Yd.	Trench, Unclassified	$________	$________
(c)	50	Cu.Yd.	Crushed Stone Backfill	$________	$________
(d)	100	Sq.Ft.	Steel Sheeting	$________	$________

Item No.	Approx. Quantity	Unit	Description	Unit Price	Total Amount
21.			Concrete Work		
(a)	20	Cu.Yd.	Class "A" Concrete	$________	$________
(b)	20	Cu.Yd.	Class "B" Concrete	$________	$________
(c)	30	Cu.Yd.	Class "C" Concrete	$________	$________
(d)	3	Tons	Reinforcing Steel	$________	$________
(e)	1,000	Sq.Ft.	Contact Forms	$________	$________
22.			C.I. Pipe, In Place (B. & S. or Mechanical Joint)		
(a)	40	Lin.Ft.	2-Inch	$________	$________
(b)	30	Lin.Ft.	4-Inch	$________	$________
(c)	30	Lin.Ft.	6-Inch	$________	$________
(d)	20	Lin.Ft.	8-Inch	$________	$________
(e)	20	Lin.Ft.	10-Inch	$________	$________
(f)	20	Lin.Ft.	12-Inch	$________	$________
(g)	20	Lin.Ft.	16-Inch	$________	$________
(h)	20	Lin.Ft.	24-Inch	$________	$________
23.			C. I. Fittings		
(a)	0.5	Tons	B. & S.	$________	$________
(b)	0.5	Tons	Mechanical Joint	$________	$________
(c)	0.5	Tons	Flanged	$________	$________
24.			Plug Valves (Use Type in Base Bid) (St'd Setting)		
(a)	2	Each	4-Inch, B. & S.	$________	$________
(b)	2	Each	4-Inch, Flanged	$________	$________
(c)	2	Each	6-Inch, B. & S.	$________	$________
(d)	1	Each	6-Inch, Flanged	$________	$________
(e)	1	Each	8-Inch, B. & S.	$________	$________
(f)	1	Each	8-Inch, Flanged	$________	$________

Sub-Total, Section III, Item Nos. 20 and 24, Inclusive $________________

TOTAL, DIVISION ONE, Complete Work, Sum-Total, Sections I, II and III, the amount of ____

____ Dollars ($________________)

ALTERNATE EQUIPMENT

The Bidder, at his own option, may offer in the spaces provided below the bid price and name of other makes of equipment which he may desire to substitute for specified makes of equipment listed in Section II of the Proposal.

Make of Alternate Equipment	Price
Make ________________________	$____________
Description ____________________	
Make ________________________	$____________
Description ____________________	
Make ________________________	$____________
Description ____________________	
Make ________________________	$____________
Description ____________________	
Make ________________________	$____________
Description ____________________	
Make ________________________	$____________
Description ____________________	
Make ________________________	$____________
Description ____________________	
Make ________________________	$____________
Description ____________________	
Make ________________________	$____________
Description ____________________	

DEDUCTIONS

The Owner reserves the right to make certain changes in the work for the purpose of making an award. Each bidder shall fill in the deductible amounts as required below. Any or all deductions may be made at the option of the Owner.

Deduction No.	Description		Amount
D-1	Eliminate rye grassing in accordance with Section No. 3 of Specifications	Deduct	$__________
D-2	Eliminate chlorine building and equipment in accordance with Section No. 14 of Specifications	Deduct	$__________
D-3	Eliminate provisions for 2 (two) future gas recirculation systems from digester covers in accordance with Section No. 10 of Specifications.		
		Deduct (a) $______	
		Deduct (b) $______	
		Deduct (c)	$__________
D-4 (Optional)	For the award of Division One and Division Two as a single contract,	deduct the amount of	$__________

(This deduction shall be made in four equal installments from the second, third, fourth and fifth partial payments to the Contractor)

DIVISION TWO

INTERCEPTOR SEWER "A"

TRUNK SEWERS A-1, A-2, A-3, A-4 and A-5

AND APPURTENANCES

Item No.	Approx. Quantity	Unit	Description	Using Clay Pipe		Using Conc. Pipe	
				Unit Price	Total Amount	Unit Price	Total Amount
1.			8" Pipe Sewers				
(a)	180	Lin.Ft.	0' - 4' Cut	$	$	$	$
(b)	150	Lin.Ft.	4' - 6' Cut	$	$	$	$
(c)	275	Lin.Ft.	6' - 8' Cut	$	$	$	$
(d)	75	Lin.Ft.	8' - 10' Cut	$	$	$	$
(e)	130	Lin.Ft.	10' - 12' Cut	$	$	$	$
2.			10" Pipe Sewers				
(a)	95	Lin.Ft.	0' - 4' Cut	$	$	$	$
(b)	295	Lin.Ft.	4' - 6' Cut	$	$	$	$
(c)	220	Lin.Ft.	6' - 8' Cut	$	$	$	$
(d)	300	Lin.Ft.	8' - 10' Cut	$	$	$	$
3.			12" Pipe Sewers				
(a)	525	Lin.Ft.	0' - 4' Cut	$	$	$	$
(b)	1,270	Lin.Ft.	4' - 6' Cut	$	$	$	$
(c)	995	Lin.Ft.	6' - 8' Cut	$	$	$	$
(d)	760	Lin.Ft.	8' - 10' Cut	$	$	$	$
(e)	640	Lin.Ft.	10' - 12' Cut	$	$	$	$
(f)	185	Lin.Ft.	12' - 14' Cut	$	$	$	$
(g)	115	Lin.Ft.	14' - 16' Cut	$	$	$	$
(h)	95	Lin.Ft.	16' - 18' Cut	$	$	$	$
(i)	20	Lin.Ft.	18' - 20' Cut	$	$	$	$
4.			15" Pipe Sewers				
(a)	75	Lin.Ft.	0' - 4' Cut	$	$	$	$

Item No.	Approx. Quantity	Unit	Description	Using Clay Pipe		Using Conc. Pipe	
				Unit Price	Total Amount	Unit Price	Total Amount
4.			15" Pipe Sewers				
(b)	35	Lin.Ft.	4' - 6' Cut	$______	$__________	$______	$__________
(c)	50	Lin.Ft.	6' - 8' Cut	$______	$__________	$______	$__________
5.			18" Pipe Sewers				
(a)	190	Lin.Ft.	0' - 4' Cut	$______	$__________	$______	$__________
(b)	775	Lin.Ft.	4' - 6' Cut	$______	$__________	$______	$__________
(c)	2,280	Lin.Ft.	6' - 8' Cut	$______	$__________	$______	$__________
(d)	635	Lin.Ft.	8' - 10' Cut	$______	$__________	$______	$__________
(e)	270	Lin.Ft.	10' - 12' Cut	$______	$__________	$______	$__________
6.			21" Pipe Sewers				
(a)	965	Lin.Ft.	0' - 4' Cut	$______	$__________	$______	$__________
(b)	275	Lin.Ft.	4' - 6' Cut	$______	$__________	$______	$__________
(c)	380	Lin.Ft.	6' - 8' Cut	$______	$__________	$______	$__________
(d)	60	Lin.Ft.	8' - 10' Cut	$______	$__________	$______	$__________
7.			24" Pipe Sewers				
(a)	170	Lin.Ft.	0' - 4' Cut	$______	$__________	$______	$__________
(b)	130	Lin.Ft.	4' - 6' Cut	$______	$__________	$______	$__________
(c)	380	Lin.Ft.	6' - 8' Cut	$______	$__________	$______	$__________
(d)	60	Lin.Ft.	8' - 10' Cut	$______	$__________	$______	$__________
8.			30" Pipe Sewers				
(a)	375	Lin.Ft.	0' - 4' Cut	$______	$__________	$______	$__________
(b)	565	Lin.Ft.	4' - 6' Cut	$______	$__________	$______	$__________
(c)	490	Lin.Ft.	6' - 8' Cut	$______	$__________	$______	$__________
(d)	160	Lin.Ft.	8' - 10' Cut	$______	$__________	$______	$__________
(e)	115	Lin.Ft.	10' - 12' Cut	$______	$__________	$______	$__________
(f)	65	Lin.Ft.	12' - 14' Cut	$______	$__________	$______	$__________
(g)	75	Lin.Ft.	14' - 16' Cut	$______	$__________	$______	$__________

Item No.	Approx. Quantity	Unit	Description	Using Clay Pipe		Using Conc. Pipe	
				Unit Price	Total Amount	Unit Price	Total Amount
8.			30" Pipe Sewers				
(h)	80	Lin.Ft.	16' - 18' Cut	$______	$______	$______	$______
(i)	20	Lin.Ft.	18' - 20' Cut	$______	$______	$______	$______
Sub-Total, Item Nos. 1 to 8, Inclusive					$______		$______

Item No.	Approx. Quantity	Unit	Description	Unit Price	Total Amount
9.			42" Conc. Pipe Sewers		
(a)	315	Lin.Ft.	0' - 4' Cut	$______	$______
(b)	535	Lin.Ft.	4' - 6' Cut	$______	$______
(c)	1,510	Lin.Ft.	6' - 8' Cut	$______	$______
(d)	1,825	Lin.Ft.	8' - 10' Cut	$______	$______
(e)	840	Lin.Ft.	10' - 12' Cut	$______	$______
(f)	45	Lin.Ft.	12' - 14' Cut	$______	$______
10.			10" C.I. Pipe, Mech. Jt., Sewers, Class 22		
(a)	321	Lin.Ft.	0' - 4' Cut or on piers	$______	$______
(b)	15	Lin.Ft.	4' - 6' Cut	$______	$______
(c)	6	Lin.Ft.	6' - 8' Cut	$______	$______
11.			12" C.I. Pipe, Mech. Jt., Sewers, Class 22		
(a)	80	Lin.Ft.	0' - 4' Cut or on piers	$______	$______
12.			16" C.I. Pipe, Mech. Jt., Sewers, Class 22		
(a)	32	Lin.Ft.	0' - 4' Cut or on piers	$______	$______
13.			18" C.I. Pipe, Mech. Jt., Sewers, Class 23		
(a)	10	Lin.Ft.	4' - 6' Cut	$______	$______
14.			20" C.I. Pipe, Mech. Jt., Sewers, Class 22		
(a)	176	Lin.Ft.	0' - 4' Cut or on piers	$______	$______
15.			30" C.I. Pipe, Mech. Jt., Sewers, Class 22		
(a)	48	Lin.Ft.	0' - 4' Cut or on piers	$______	$______

Item No.	Approx. Quantity	Unit	Description	Unit Price	Total Amount
16.			42" C.I. Pipe, Mech. Jt., Sewers, Class 22		
(a)	164	Lin.Ft.	0' - 4' Cut or on piers	$______	$________
(b)	12	Lin.Ft.	4' - 6' Cut	$______	$________
17.			20" Ductile Iron Pipe, Mech. Jt., Sewers, Class 23		
(a)	148.3	Lin.Ft.	0' - 4' Cut or on piers	$______	$________
18.	1	Lump Sum	20" Ductile Iron Pipe, Mech. Jt., Sewers, Class 23, Installed on piers at river crossing Trunk Sewer A-1, Sta. 0 + 02 to Sta. 1 + 59.6	L.S.	$________
19.	1	Lump Sum	16" Ductile Iron Pipe, Mech. Jt., Sewers, Class 23, Installed on piers at river crossing Trunk Sewer A-3, Sta. 3 + 43 to Sta. 4 + 63	L.S.	$________
20.	1	Lump Sum	Remove existing manhole, Sta. 6 + 53, Trunk Sewer A-1	L.S.	$________
21.			St'd Brick Manholes, 4'-0" Diameter		
(a)	1	Each	0' - 4' Deep	$______	$________
(b)	8	Each	4' - 6' Deep	$______	$________
(c)	23	Each	6' - 8' Deep	$______	$________
(d)	5	Each	8' - 10' Deep	$______	$________
(e)	4	Each	10' - 12' Deep	$______	$________
(f)	3	Each	12' - 14' Deep	$______	$________
(g)	1	Each	18' - 20' Deep	$______	$________
22.			St'd Brick Manholes, 5'-0" Diameter		
(a)	1	Each	4' - 6' Deep	$______	$________
(b)	5	Each	6' - 8' Deep	$______	$________
(c)	2	Each	8' - 10' Deep	$______	$________
(d)	1	Each	10' - 12' Deep	$______	$________
(e)	1	Each	12' - 14' Deep	$______	$________
23.			St'd Brick Manholes, 6'-0" Diameter		
(a)	6	Each	6' - 8' Deep	$______	$________
(b)	4	Each	8' - 10' Deep	$______	$________

Item No.	Approx. Quantity	Unit	Description	Unit Price	Total Amount
23.			St'd Brick Manholes, 6'-0" Diameter		
(c)	3	Each	10' - 12' Deep	$______	$__________
24.			Drop Manholes, 4'-0" Diameter		
(a)	2	Each	8' - 10' Deep	$______	$__________
(b)	1	Each	12' - 14' Deep	$______	$__________
25.			Angle Manholes for 42" Pipe Delta = 60° to 90°		
(a)	2	Each	8' - 10' Deep	$______	$__________
26.	1	Lump Sum	Junction Manhole, Station 58 + 86, Interceptor Sewer A	L.S.	$__________
27.	1	Lump Sum	Junction Manhole, Station 1 + 61.9, Trunk Sewer A-1	L.S.	$__________
28.			C.I. Manhole Frames and Covers		
(a)	22	Each	350 Lb. Standard	$______	$__________
(b)	2	Each	450 Lb. Standard	$______	$__________
(c)	51	Each	Type "A" (Watertight)	$______	$__________
29.			Conc. Piers, Type "A-1", Incl. Pipe Straps		
(a)	5	Each	0' - 4' High for 20" Pipe	$______	$__________
(b)	1	Each	0' - 4' High for 12" Pipe	$______	$__________
(c)	6	Each	0' - 4' High for 10" Pipe	$______	$__________
(d)	1	Each	4' - 6' High for 12" Pipe	$______	$__________
(e)	1	Each	4' - 6' High for 10" Pipe	$______	$__________
(f)	5	Each	6' - 8' High for 10" Pipe	$______	$__________
30.			Conc. Piers, Type "A-2", Incl. Pipe Straps		
(a)	2	Each	8' - 10' High for 10" Pipe	$______	$__________
(b)	1	Each	10' - 12' High for 10" Pipe	$______	$__________
(c)	2	Each	12' - 14' High for 20" Pipe	$______	$__________

Item No.	Approx. Quantity	Unit	Description	Unit Price	Total Amount
30.			Conc. Piers, Type "A-2", Incl. Pipe Straps		
(d)	1	Each	14' - 16' High for 10" Pipe	$______	$__________
(e)	1	Each	16' - 18' High for 10" Pipe	$______	$__________
31.			Conc. Piers, Type "B", Incl. Pipe Straps		
(a)	3	Each	4' - 6' High for 42" Pipe	$______	$__________
(b)	2	Each	4' - 6' High for 30" Pipe	$______	$__________
(c)	4	Each	6' - 8' High for 42" Pipe	$______	$__________
32.			River Crossing Piers, Trunk Sewer A-1, Incl. Pipe Straps		
(a)	30.	Cu.Yds.	Class "A" Concrete	$______	$__________
(b)	30.	Cu.Yds.	Class "B" Concrete	$______	$__________
33.			River Crossing Piers, Trunk Sewer A-3, Incl. Pipe Straps		
(a)	11.	Cu.Yds.	Class "A" Concrete	$______	$__________
(b)	20.	Cu.Yds.	Class "B" Concrete	$______	$__________
34.			Concrete Collars		
(a)	6	Each	For 42" Pipe	$______	$__________
(b)	2	Each	For 30" Pipe	$______	$__________
(c)	2	Each	For 20" Pipe	$______	$__________
(d)	1	Each	For 16" Pipe	$______	$__________
(e)	4	Each	For 12" Pipe	$______	$__________
(f)	1	Each	For 10" Pipe	$______	$__________
35.	1	Lump Sum	Additional cost of Conc. Encasement, Sta. 14 + 14 to Sta. 16 + 37, Trunk Sewer A-3	L.S.	$__________
36.	2,400	Cu.Yds.	Rock Excavation	$ 10.00	$ 24,000.00
37.	1,560	Cu.Yds.	Channel Excavation (Unclassified)	$______	$__________
38.	2,600	Cu.Yds.	Earth Fill Over Sewers and Embankment	$______	$__________

Item No.	Approx. Quantity	Unit	Description	Unit Price	Total Amount
39.			Benching, Trunk Sewer A-4		
(a)	1	Lump Sum	Sta. 32 + 00 to Sta. 36 + 00	L.S.	$________
(b)	1	Lump Sum	Sta. 41 + 51 to Sta. 43 + 50	L.S.	$________
(c)	1	Lump Sum	Sta. 57 + 50 to Sta. 60 + 00	L.S.	$________
40.	100	Sq.Yds.	Dumped Stone Rip-Rap	$______	$________
41.	800	Sq.Ft.	Steel Sheeting	$______	$________
42.			Paving, Removed and Replaced		
(a)	73	Lin.Ft.	Bituminous Surface Treatment	$______	$________
			EXTRA WORK, IF ORDERED BY ENGINEER		
43.			Concrete, where specified for payment for pipe bedding, plugging pipe, pipe encasement and authorized changes to structures.		
(a)	10	Cu.Yds.	Class "A", Including Form Work	$______	$________
(b)	10	Cu.Yds.	Class "B"	$______	$________
(c)	20	Cu.Yds.	Class "C"	$______	$________
44.	200	Lbs.	Bar Reinforcing Steel, In Place	$______	$________
45.			Steel Piling, BP-8		
(a)	100	Lin.Ft.	Steel Piling	$______	$________
(b)	4	Each	Steel Pile Splice	$______	$________
46.	5	MBM	Timber Bracing and Sheeting Left in Place	$______	$________
47.	600	Cu.Yds.	Crushed Stone Backfill, Including Excavation of Unsuitable Materials	$______	$________

Sub-Total, Item Nos. 9 to 47, Inclusive $__________

TOTAL, DIVISION TWO (Using Clay Pipe for Sewers),
Item Nos. 1 to 47, Inclusive:

____

____ Dollars ($__________)

TOTAL, DIVISION TWO (Using Conc. Pipe for Sewers),
Item Nos. 1 to 47, Inclusive

____

_______________________________________Dollars ($____________)

The Bidder declares that he understands that the quantities shown in the Proposal are subject to adjustment by either increase or decrease, and that should the quantities of any of the items of work be increased, the undersigned proposed to do the additional work at the unit prices stated herein; and should the quantities be decreased, he also understands that payment will be made on actual quantities at the unit price bid and will make no claim for anticipated profits for any decrease in the quantities and that actual quantities will be determined upon completion of work, at which time adjustment will be made to the contract amount by direct increase or decrease.

The Bidder further proposes and agrees hereby to commence work under his contract on a date to be specified in a written order of the Engineer, and shall fully complete all work thereunder within the following number of consecutive calendar days from and including said date:

540 Days for Division One

450 Days for Division Two

The undersigned further agrees that, in case of failure on his part to execute the said Contract and the Bond within ten (10) consecutive calendar days after written notice being given of the award of the Contract, the Check or Bid Bond accompanying this bid, and the monies payable thereon, shall be paid into the funds of the City of Athens, Georgia, as liquidated damages for such failure; otherwise, the Check or Bid Bond accompanying this Proposal shall be returned to the undersigned.

Attached hereto is a Certified Check on the______________________

____

Bank of_______________________________________

or a Bid Bond by the__________________________________

in the amount of______________________________________

_____________________________________Dollars ($______________)
made payable to the City of Athens, Georgia, in accordance with the conditions of the Advertisement and provisions herein.

(Signed)______________________________L.S.

By:______________________________L.S.

(NOTE: If the Bidder is a corporation, the Proposal shall be signed by an officer of the corporation; of a partnership, it shall be signed by a partner. If signed by others, authority for signature shall be attached).

Address:_______________________________________

____

The full names and residences of persons and firms interested in the foregoing bid, as principals, are as follows:

____

____

____

____

____

____

EXPERIENCE AND REFERENCES

The bidder shall here state what work he has done of similar nature of that bid for, and give references that will afford the Owner opportunity to judge as to experience, skill, business standing and financial ability.

____

____

____

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____

CONTRACT AGREEMENT

This Agreement made and entered into on the ___ day of __________, 19___, by and between the City of Athens, Georgia, party of the first part (hereinafter called the "Owner") and

____ party of the second part (hereinafter called the "Contractor").

WITNESSETH:

That the Contractor, for the consideration hereinafter fully set out hereby, agrees with the Owner as follows:

1. That the Contractor will furnish all equipment, tools, materials, skill and labor of every description, necessary to carry out and to complete in a good, firm, substantial and workmanlike manner the construction of all the work specified under

Division ____

____

in strict conformity with drawings numbered one to __________, inclusive, dated July, 1960 and entitled "City of Athens, Georgia, Sewerage System Improvements, Contract 'A'," and the Specifications hereinafter set forth which drawings and specifications, together with the foregoing Proposal made by the Contractor, the Notice to Bidders, Instructions to Bidders and Special Provisions, General Conditions, this Agreement, Performance and Payment Bonds, and all addenda, hereto annexed, shall form essential parts of this Agreement, as if fully contained herein. The work covered by this Agreement, includes all work as shown on the drawings, specified, and listed in the attached Proposal.

2. That the Contractor shall commence the work to be performed under this Agreement on a date to be specified in a written order of the Owner's Engineer and shall fully complete all work hereunder, except as otherwise provided in these documents for extension of the time limit, within the following number of consecutive calendar days from said date:

_______ days for Division _______

_______ days for Division _______

Time is of the essence of this contract, and the Contractor shall pay to the Owner, not as a penalty, but as liquidated damages, for each calendar day that he shall be in default of completing the work within the time limit named herein, the amount computed in accordance with the following schedule:

Division	Amount per Day
One	$ 40.00
Two	$ 40.00

Because of the difficulty of fixing damages suffered by the Owner on account of such default, damages are herein agreed upon as stated.

3. The Owner hereby agrees to pay to the Contractor for the faithful performance of this Agreement, subject to additions and deductions as provided in the Specifications or Proposal, in lawful money of the United States, the sum of

____

____ Dollars ($____________)

4. On or before the 15th day of each calendar month, the Owner shall make partial payments to the Contractor on the basis of a duly certified and approved estimate of work performed during the preceding calendar month by the Contractor, including materials delivered to the site, less ten (10%) per cent of the amount of such estimate which is to be retained by the Owner until all work has been performed strictly in accordance with this Agreement, and until such work has been accepted by the Owner.

5. Upon submission by the Contractor of evidence satisfactory to the Owner that all payrolls, material bills and other cost incurred by the Contractor in connection with the construction of the work have been paid in full, final payment on account of this Agreement shall be made within thirty (30) days after the completion by the Contractor of all work covered by this Agreement and the acceptance of such work by the Owner.

6. It is further mutually agreed between the parties hereto that if, at any time after the execution of this Agreement and the surety bonds hereto attached for its faithful performance, the Owner shall deem the surety or sureties upon such bond to be unsatisfactory, or if, for any reason, such bond ceases to be adequate to cover the performance of the work, the Contractor shall, at his expense, within five (5) days after the receipt of notice from the Owner so to do, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the Owner. In such event no further payment to the Contractor shall be deemed to be due under this Agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the Owner.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement under their respective seals on the day and date first above written in four (4) counterparts, each of which shall without proof or accounting for the other counterparts, be deemed an original contract.

ATTEST: (As to Contractor)

Signed and sealed in the presence of:

____

____

* CONTRACTOR

____

By: ______________________________
(Title)

ATTEST: (SEAL)

____
Secretary

(SEAL)

ATTEST:

____
City Clerk

CITY OF ATHENS, GEORGIA

By: ______________________________
Mayor

Approved as to form before execution

By: ______________________________
Attorney for the City

* (Note: If the Contractor is a corporation, the Agreement shall be signed by the President or Vice-President, attested by the Secretary and the corporate seal affixed. If the Contractor is a partnership, the Agreement shall be signed in the partnership name by one of the partners, with indication that he is a general partner.)

PERFORMANCE BOND

CLARKE COUNTRY)
) ss.
STATE OF GEORGIA)

KNOW ALL MEN BY THESE PRESENTS, THAT we ______________________________
____, hereinafter known as
the "Contractor," as principal, and ______________________________
as surety, are held and firmly bound unto the City of Athens, Georgia, hereinafter known as the Owner, in the penal sum of

____

____ Dollars ($________________)
lawful money of the United States of America, to be paid to the Owner, for the use and benefit of the said obligee, and of all persons doing work or furnishing skill, tools, machinery or materials under or for the purpose of the contract hereinafter named, for which payment, well and truly to be made, we bind ourselves, our successors and our several respective heirs, assigns, executors and administrators, jointly and severally, firmly by these presents.

SEALED WITH OUR SEALS AND DATED THIS THE ___ DAY OF ____________, 19___.

WHEREAS, the above bounden ______________________________________
________________________________ by an instrument in writing, bearing even date, with these presents, has contracted with the Owner to furnish all equipment, tools, materials, skill and labor for the completion of the work covered by the following items of the attached Proposal for constructing Sewerage System Improvements, to-wit: ____

____

____
All work to be performed in strict accordance with the attached Agreement or Contract and Specifications, which Contract if by reference made a part hereof:

NOW, THE CONDITION OF THIS OBLIGATION IS SUCH, That if the said

____
shall complete the work provided for in said Contract according to the terms, and shall save the obligee hereunder free from all costs and charges that may accrue on account of the doing of the work specified in the contract, and shall comply with the laws appertaining to said Contract, then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

AND THE FURTHER CONDITION OF THIS OBLIGATION IS SUCH THAT IF __________
____, as Contractor,
shall fully and faithfully perform the work in accordance with the terms of the

annexed contract therefor and the plans and specifications therein referred to, and provide the materials therein called for, and replace defective work or material for a period of one year after the completion of this contract, then

this obligation shall be null and void; otherwise they, ______________________

____, as Contractor and

____, as surety,

jointly and severally agree to pay the Owner the difference between the sum to

which the said ____,

as Contractor, would be entitled in the completion of the Contract, and that which the Owner may be obliged to pay for the completion of the work by Contract, or otherwise, and agree to pay any damage, direct or indirect or consequential, which said Owner may sustain on account of such work or on account of the failure of said Contractor, properly and in all things to keep and execute the provisions of the Contract.

And the said ____

as Contractor, and ____
as surety, hereby further bind themselves, their successors, assigns, heirs, executors and administrators, jointly and severally, that they will indemnify and save harmless and will pay all amounts, damages, costs and judgments which may be recovered against, and all expenses incurred by, the Owner and all representatives of said Owner from or arising out of all or any suits, actions, or claims of any character brought on account of any injuries or damages sustained by any persons or property in consequence of any neglect in safeguarding the work, or any such suit or claim arising from any other act, omission, negligence or misconduct of the Contractor, his agents, representatives, servants and employees in the performance of said work or of the repair of maintenance thereof, or the manner of doing the same, or the neglect of said Contractor, or agents or servants, or the improper performance of the said work by the Contractor or agents or servants, or the infringement of any patent rights by reason of the use of any equipment or materials furnished under the said Contract, and will also pay any damages for delay in performance within the time agreed, as stated in the Contract; further, failure so to do with such persons, firms, partnerships or corporation shall give them a direct right of action against the principal and surety under this obligation.

As the said surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the Contract or to the work to be performed thereunder, or the specifications accompanying the same, shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the Specifications.

Without limiting the effect of any other provisions herein contained, this Bond is to be construed as a statutory bond under the provisions of Section 23-1705 of the 1933 Code of Georgia as amended to date.

IN WITNESS WHEREOF, the said ______________________________

has caused ______________ corporate seal to be hereto affixed, and these

presents to be signed in its name by ______________________________

and the said ______________________________

as surety, has caused ______________ corporate seal to be hereto affixed and

these presents to be signed in its name by ______________________________.

(As to Contractor)	* CONTRACTOR (SEAL)
Signed, sealed and delivered in the presence of:	______________________________
	By: ______________________________ (Title)
______________________________	
______________________________	ATTEST:
	______________________________ Secretary
(As to Surety)	
Signed, sealed and delivered in the presence of:	SURETY: (SEAL)
______________________________	______________________________
______________________________	By: ______________________________ Attorney in Fact
APPROVED as to form:	COUNTERSIGNED
______________________________ City Attorney	By: ______________________________ Resident Agent

* (Note: If the Principal is a corporation, the bond shall be signed by the President or a Vice-President, attested by the Secretary and the corporate seal affixed. If the Principal is a partnership, the bond shall be signed in the partnership name by one of the partners, with indication that he is a general partner.)

LMB-1

PAYMENT BOND

CLARKE COUNTY)
) ss.
STATE OF GEORGIA)

KNOW ALL MEN BY THESE PRESENTS, That we ______________________________

______________________________, hereinafter known as the "Contractor", as principal, and ______________________________, as surety, are held and firmly bound unto the City of Athens, Georgia hereinafter known as the Owner, in

the penal sum of ______________________________

______________________________ Dollars ($______________) lawful money of the United States of America, to be paid to the Owner, for the use and benefit of the said obligee, and of all persons doing work or furnishing skill, tools, machinery or materials under or for the purpose of the Contract hereinafter named, for which payment, well and truly to be made, we bind ourselves, our successors and our several respective heirs, assigns, executors and administrators, jointly and severally, firmly by these presents.

SEALED WITH OUR SEALS AND DATED THIS THE ____ DAY OF __________, 19__.

WHEREAS, the above bounden ______________________________

______________________________ by an instrument in writing, bearing even date, with these presents, has contracted with the Owner to furnish all equipment, tools, materials, skill and labor for the completion of the work covered by the following items of the attached Proposal for constructing Sewerage System

Improvements, to-wit: ______________________________

____

____

All work to be performed in strict accordance with the attached Agreement or Contract and Specifications, which Contract is by reference made a part hereof:

NOW, THE CONDITION OF THIS OBLIGATION IS SUCH, That if the said __________

______________________________ and all subcontractors to whom any portion of the work provided for in the

attached Agreement or Contract is sublet nad all assignees of the said __________

______________________________ and of such subcontractors shall promptly make payments to all persons supplying him or them with labor, materials, or supplies for or in the prosecution of the work provided for in such Contract, or in any amendment or extension of or addition to said Contract, and for the payment or reasonable attorneys fees, incurred by the claimant or claimants in suits on said bond, then the above obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, however, that this bond is subject to the following conditions and limitations:

(a) Any person, firm or corporation that has furnished labor, materials, or supplies for or in the prosecution of the work provided for in said Contract shall have a direct right of action against the Contractor and Surety on this bond, which right of action shall be asserted in a proceeding, instituted in the county in which the work provided for in said contract is to be performed or in any County in which said Contractor or Surety does business. Such right of action shall be asserted in a proceeding instituted in the name of the claimant or claimants for his or their use and benefit against said Contractor and Surety or either of them (but not later than one year after the final settlement of said Contract) in which action such claim or claims shall be adjudicated and judgment rendered thereon.

(b) The Principal and Surety hereby designate and appoint the ______________________________ as the agent of each of them to receive and accept service of process or other pleading issued or filed in any proceeding instituted on this bond and hereby consent that such service shall be the same as personal service on the Contractor and/or Surety.

(c) In no event shall the Surety be liable for a greater sum than the penalty of this bond, or subject to any suit, action or proceeding thereon that is instituted later than one year after the final settlement of said Contract.

(d) This bond is given pursuant to the terms of Section 23-1705 of the 1933 Code of Georgia as amended and all the provisions of law with reference to this character of bond as set forth in said section or as may hereinafter be enacted are hereby made a part hereof to the same extent as if set out herein in full.

IN WITNESS WHEREOF, the said ______________________________

______________________________ has caused ______________ corporate seal to be hereto affixed, and these presents to be signed in its name by ______________

____

and the said ____

______________________________ as surety, has caused ______________ corporate seal to be hereto affixed and these presents to be signed in its name by

____.

(As to Contractor)

Signed, sealed and delivered
in the presence of:

____

____

(As to Surety)

Signed, sealed and delivered
in the presence of:

____

____

APPROVED as to form:

____
City Attorney

* CONTRACTOR (SEAL)

____

By: ______________________________
(Title)

ATTEST:

____
Secretary

SURETY: (SEAL)

____

By: ______________________________
Attorney in Fact

COUNTERSIGNED

By: ______________________________
Resident Agent

* (Note: If the Principal is a corporation, the bond shall be signed by the President or a Vice-President, attested by the Secretary and the corporate seal affixed. If the Principal is a partnership, the bond shall be signed in the partnership name by one of the partners, with indication that he is a general partner.)

GENERAL CONDITIONS

1. Contract Security: The Contractor shall furnish a surety performance bond (form attached) in an amount at least equal to 100 per cent of the contract price as security for the faithful performance of this contract, and to indemnify the Owner against liability for personal injury and property damage. The Contractor shall also furnish a payment bond (form attached) in an amount at least equal to 100 per cent of the contract as security for the payment of all persons performing labor and furnishing materials in connection with this contract.

The surety on each of the above bonds shall be a surety company satisfactory to the Owner duly authorized to do business in Clarke County, Athens, Georgia. The person executing the bond on behalf of the surety shall file with the bond a general power of attorney unlimited as to amount and type of bond covered by such power of attorney, and certified to by an official of said surety.

A surety bond for roofing shall be furnished to the Owner, as stated in Section No. 9, before final payment is made under this contract.

2. Contractors' and Subcontractors' Insurance: The Contractor shall not commence work under this contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been so obtained and approved.

(a) Compensation Insurance: The Contractor shall procure and shall maintain during the life of this contract Workmen's Compensation Insurance for all of the employees to be engaged in work on the project under this contract, and in case any such work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation Insurance. In case any class of employees engaged in hazardous work on the project under this contract is not protected under the Workman's Compensation statute, the Contractor shall provide and shall cause such subcontractor to provide a Workmen's Compensation policy for the protection of such of his employees not otherwise protected.

(b) Public Liability, Property Damage, and Automobile Liability Insurance: The Contractor shall take out and maintain during the life of the contract such Public Liability and Property Damage Insurance and Automobile Liability Insurance as shall protect him and any subcontractor performing work covered by this contract from claims for damage for personal injury including accidental death as well as from claims for property damage, which may arise from operations under this contract, whether such operations are by himself or by any subcontractor or by anyone directly or indirectly employed by either of them. The amount of such insurance shall be as follows:

1. Public liability insurance in an amount not less than $100,000 for bodily injury, including accidental death, to any one person, and subject to the same limit for each person, in an amount not less than $300,000 on account of one accident.

2. Property damage insurance in an amount not less than $50,000 for any

one damage claim, and in an aggregate amount up to $100,000 during a period of twelve (12) months.

3. Automobile liability insurance: a. For bodily injury, including accidental death to any one person, in an amount not less than $100,000 and subject to the same limit for each person, in an amount not less than $300,000 on account of one accident; b. For property damage in an amount not less than $50,000 for any one damage claim and in an aggregate amount up to $100,000 during a period of twelve (12) months.

(c) Owner's Protective Liability Insurance: Issued in the name of the Owner for liability and property damage in the same amounts as stipulated for the Contractor.

(d) Fire Insurance: The Contractor for Division One shall insure all work against loss or damage by fire and against loss or damage covered by the standard extended coverage insurance indorsement, the amount of the insurance at all times to be at least equal to the amount paid on account of work and materials. The policies shall be in the names of the Owner and the Contractor as their interests may appear.

(e) Proof of Coverage of Insurance: The Contractor shall furnish the Owner with a certificate showing satisfactory proof of carriage of the insurance required prior to commencing work on his contract.

(f) Scope of Insurance: The insurance required under subparagraphs (b), (c) and (d) hereof shall provide adequate protection for the Contractor and his subcontractors, respectively, as well as the Owner, against damage claims which may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him.

3. Accident Prevention: Precaution shall be exercised at all times for the protection of all persons, including employees, and property, and hazardous conditions shall be guarded against or eliminated. The Contractor shall be responsible for all injuries or damages to persons or property, and shall indemnify and save harmless the Owner, its officers and agents, from all damages and costs by reason of injury to person or property, resulting from negligence or carelessness in the performance of the work or in guarding the same, or from any improper materials, implements, or appliances used in its construction, or on account of any act or omission of the Contractor, his agents or employees. The whole or as much of the monies due under and by virtue of this contract as may be considered necessary by the Owner shall or may be retained by the Owner until all suits or claims for damages shall have been settled, and evidence to that effect furnished to the satisfaction of the Owner.

4. Laws: The construction of said project shall in all respects conform to all applicable requirements of State and local laws and ordinances.

5. Inspection by Agencies: The representatives of the Public Health Service of the U. S. Department of HEW and of the state water pollution control agency of the State of Georgia shall have access to the work wherever it is, in preparation or progress, and the Contractor shall provide proper facilities for such access and inspection.

*6. Anti-Kickback Provisions:

(a) The Anti-Kickback Regulations issued by the Secretary of Labor (29 CFR, Part 3) are applicable to this contract. The Contractor will comply with these Regulations (a copy of which is attached) and any amendments or modifications thereof, will cause appropriate provisions to be inserted in subcontracts to insure compliance therewith by all subcontractors subject thereto, and will be responsible for the submission of affidavits required of subcontractors thereunder, except as the Secretary of Labor may specifically provide for reasonable limitations, variations, tolerances and exemptions from the requirements thereof. In lieu of mailing affidavits required by Sections 3.3 and 3.4 of the Anti-Kickback Regulations to the Federal agency furnishing financial aid on this project, the Contractor shall submit all such affidavits promptly, as specified, to the Owner or to a representative designated by the Owner.

(b) The Owner, or his representative, may withhold or cause to be withheld from the Contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics employed by the Contractor or any subcontractor on the work (except for such deductions as are permitted by the Anti-Kickback Regulations (29 CFR, Part 3)), the full amount of wages to which they are entitled under their contracts of employment. In the event of failure to pay any laborer or mechanic employed or working on the site of the work all or part of the wages to which he is entitled under his contract of employment, the Owner, or his representative, may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(c) Payroll records shall contain the information and be preserved as required by Section 3.4(b) of the Regulations. The Contractor will make his employment records available for inspection by authorized representatives of the State Water Pollution Control Agency, the Secretary of Labor and the Surgeon General, and will permit such representatives to interview employees during working hours on the job.

(d) The Contractor will insert in each of his subcontracts the provisions set forth in the foregoing clauses hereof, and such other stipulations as the Surgeon General may require by appropriate instructions.

(e) A breach of stipulations (a) through (d) may be grounds for termination of the contract.

*(The General Counsel's digest of opinions for the U.S.P.H.S. regarding the above act is quoted in the following for the information of bidders: "The Davis-Bacon Act (40 U.S.C. 276a) (requiring compliance with minimum rates of pay prescribed by the Secretary of Labor) is not applicable to construction contracts entered into by grantees under section 6 of the Federal Water Pollution Control Act. The Anti-Kickback Act (40 U.S.C. 276c) is applicable to such contracts, and compliance by contracts with the Act and regulations promulgated thereunder by the Secretary of Labor is mandatory.")

7. Reports, Records and Data: The Contractor and each of his subcontractors shall submit to the Owner such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.

8. Payments to Contractor:

(a) Not later than the 15th day of each calendar month the Owner will make a partial payment to the Contractor on the basis of a duly certified and approved estimate of the work performed during the preceding calendar month under this contract, but to insure the proper performance of this contract, the Owner will retain ten per cent (10%) of the amount of each estimate until final completion and acceptance of all work covered by this contract.

(b) In preparing estimates the material delivered on the site and preparatory work done will be taken into consideration.

(c) All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or the restoration of any damaged work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the contract.

(d) Owner's Right to Withhold Certain Amounts and Make Application Thereof: The Contractor agrees that he will indemnify and save the Owner harmless from all claims growing out of the lawful demands of subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this contract. The Contractor shall furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If the Contractor fails so to do, then the Owner may, after having served written notice on the said Contractor, either pay unpaid bills, of which the Owner has written notice, direct, or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payment to the Contractor shall be resumed, in accordance with the terms of this contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor or his surety. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner, shall be considered as a payment made under the contract by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payment made in good faith.

9. Payments by Contractor: The Contractor shall pay (a) for all transportation and utility services not later than the 20th day of the calendar month following that in which services are rendered, (b) for all materials, tools, and other expendable equipment to the extent of 90% of the cost thereof, not later than the 20th day of the calendar month following that in which such materials, tools, and equipment are delivered at the site of the project, and the balance of the cost thereof not later than the 30th day following the completion of that part of the work in or on which such materials, tools, and equipment are incorporated or used, and (c) to each of his subcontractors, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his subcontractors to the extent of each subcontractor's interest therein.

10. Subcontracting:

(a) The Contractor may utilize the services of specialty subcontractors on

those parts of the work which, under normal contracting practices, are performed by specialty subcontractors.

(b) The Contractor shall not subcontract the complete work, or any major portion thereof, and shall not award any work to any subcontractor without prior written approval of the Owner, which approval will not be given until the Contractor submits to the Owner a written statement concerning the proposed award to the subcontractor, which statement shall contain such information as the Owner may require.

(c) The Contractor shall be as fully responsible to the Owner for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

(d) The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and other Contract Documents insofar as applicable to the work of subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract Documents.

(e) Nothing contained in this contract shall create any contractual relation between any subcontractor and the Owner.

11. Assignments: The Contractor shall not assign the whole or any part of this contract or any moneys due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any moneys due or to become due under this contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the Contractor shall be subject to prior liens of all persons, firms and corporations for services rendered or materials supplied for the performance of the work called for in this contract.

12. Time for Completion and Liquidated Damages: It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning, rate of progress, and the time for completion of the work to be done hereunder are ESSENTIAL CONDITIONS of this contract; and it is further mutually understood and agreed that the work embraced in this contract shall be commenced on a date to be specified in the work order.

The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work described herein is a reasonable time for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

IF THE SAID CONTRACTOR SHALL NEGLECT, FAIL OR REFUSE TO COMPLETE THE WORK WITHIN THE TIME HEREIN SPECIFIED, then the Contractor does hereby agree, as a part consideration for the awarding of this contract, to pay to the Owner the amount specified in the contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in

the contract for completing the work. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain and said amount is agreed to be the amount of damages which the Owner would sustain and said amounts shall be retained from time to time by the Owner from current periodical estimates.

It is further agreed that time is of the essence of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this contract. Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

(a) To any preference, priority, or allocation order duly issued by the Government;

(b) To unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather; and

(c) To any delays of subcontractors occasioned by any of the causes specified in subsections (a) and (b) of this article:

Provided, further, that the Contractor shall, within seven (7) days from the beginning of such delay, notify the Owner, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter.

13. Construction Schedule and Periodic Estimates: Immediately after execution and delivery of the contract, and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule. The Contractor shall also furnish a detailed estimate giving a complete breakdown of the contract price and a periodic itemized estimate of work done for the purpose of making partial payments thereon. The costs employed in making up any of these schedules will be used only for determining the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.

14. Mutual Responsibility of Contractors: If, through acts of neglect on the part of the Contractor, any other contractor or any subcontractor shall suffer loss or damage on the work, the Contractor agrees to settle with such other contractor or subcontractor by agreement or arbitration if such other contractor or subcontractor will so settle. If such other contractor or subcontractor shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

15. Extras: Without invalidating the contract, the Owner may order extra work or make changes by altering, adding to or deducting from the work, the contract

sum being adjusted accordingly, and the consent of the Surety being first obtained where necessary or desirable. All the work of the kind bid upon shall be paid for at the price stipulated in the proposal, and no claims for any extra work or materials shall be allowed unless the work is ordered in writing by the Owner or its Engineer, acting officially for the Owner, and the price is stated in such order.

16. Changes in Work: Should the Contractor encounter, or the Owner discover, during the progress of the work subsurface or latent conditions at the site materially differing from those shown on the drawings or indicated in the specifications, or unknown conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the drawings and specifications, the attention of the Owner shall be called immediately to such conditions before they are disturbed. The Owner shall thereupon promptly investigate the conditions, and if it finds that they do so materially differ, the contract shall be modified, with the written approval of the Owner, to provide for any increase or decrease of cost or difference in time resulting from such conditions. No changes in work shall be made without prior written approval by the Owner.

The Contractor shall furnish to the Owner when required an itemized breakdown of the quantities and prices used in computing the value of any change that might be ordered. In figuring changes, instructions for measurement of quantities set forth in the specifications shall be followed.

Charges or credits for the work covered by the approved change shall be determined by one or more, or a combination of the following methods:

(a) Unit bid prices stipulated in the Proposal or as subsequently approved, which unit prices shall include allowances for overhead and profit.

(b) An agreed lump sum.

(c) The actual cost, by keeping a correct account including all vouchers for:

1. Labor, including foremen.

2. Materials entering permanently into the work.

3. Ownership or rental cost of power tools and construction equipment actually used.

4. Power and consumable supplies for operation of power equipment.

5. Pro rata charges for insurance covering public liability, workmen's compensation, old age and unemployment, also social security.

To the above shall be added a fixed fee for overhead and profit, not to exceed fifteen per cent (15%) of the above items except that actual cost only will be allowed for social security, old age and unemployment insurance. Among the items considered as overhead are costs for insurance other than above, bond, superintendence, timekeeping, clerical work, watchman, use of small tools, general office expense and miscellaneous.

17. Claims for Extra Cost: No claim for extra work or cost shall be allowed

unless the same was done in pursuance of a written order of the Engineer, as aforesaid, and the claim presented with the first estimate after the changed or extra work is done. When work is performed under the terms of subsection 16(c) of these General Conditions, the Contractor shall furnish satisfactory bills, payrolls and vouchers covering all items of cost and when requested by the Owner, give the Owner access to accounts relating thereto.

18. Materials, Services and Facilities:

(a) It is understood that except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, superintendence, temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to execute, complete, and deliver the work within the specified time.

(b) Any work necessary to be performed after regular working hours, on Sundays or Legal Holidays, shall be performed without additional expense to the Owner.

19. "Or Equal" Clause: With the exception of major items of mechanical and electrical equipment, whenever a material or article required is specified or shown on the plans by using the name of the proprietary product or of a particular manufacturer or vendor, any material or article which will meet the design criteria and is equal in function and durability, as determined by the Engineer, will be considered acceptable. Provisions are made under "Instructions to Bidders and Special Provisions" for alternate bids on major items of mechanical and electrical equipment.

20. Patents:

(a) The Contractor shall hold and save the Owner and its officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.

(b) If the Contractor uses any design, device or materials covered by letters, patent or copyright, he shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, that, without exception, the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract, and shall indemnify the Owner for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

21. Inspection and Testing of Materials: Unless otherwise specifically provided for in the specifications, the inspection and testing of material and finished articles to be incorporated in the work at the site shall be made by bureaus, laboratories, or agencies arranged for by the Contractor and as selected by the Owner. The Owner will pay for all laboratory inspection service direct

and not as a part of the contract. The Contractor shall furnish all such extra quantities of materials and items as may be required for testing; and shall deliver same to the laboratory selected by the Owner. The cost of furnishing and delivering samples to the laboratory shall be paid for by the Contractor.

Where the detailed specifications call for certified copies of mill or shop tests to establish conformance of certain materials with the specifications it shall be the responsibility of the Contractor to assure the delivery of such certifications to the Owner.

No materials or finished articles shall be incorporated in the work until such materials and finished articles have passed the required tests. The Contractor shall promptly segregate and remove rejected material and finished articles from the site of the work.

The testing and approval of materials by the laboratory, or laboratories, selected by the Owner shall not relieve the Contractor of any of his obligation to fulfill his contract and guarantee of workmanship and materials as called for in Paragraph 26 herein. The Contractor may, at his option and at his own expense, cause such other tests to be conducted as he may deem necessary to assure suitability, strength and durability of any material or finished article.

22. Right of the Owner to Terminate Contract: In the event that any of the provisions of this contract are violated by the Contractor, or by any of his subcontractors, the Owner may serve written notice upon the Contractor and the Surety of its intention to terminate the contract, such notices to contain the reasons for such intention to terminate the contract, and, unless within 10 days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement of correction be made, the contract shall, upon the expiration of said ten (10) days, cease and terminate. In the event of any such termination, the Owner shall immediately serve notice thereof upon the Surety and the Contractor, and the Surety shall have the right to take over and perform the contract, provided, however, that if the Surety does not commence performance thereof within five (5) days from the date of the mailing to such Surety of notice of termination, the Owner may take over the work and prosecute the same to completion by contract or by force account for the account and at the expense of the Contractor, and the Contractor and his Surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may take possession of and utilize in completing the work, such materials, appliances, and plant as may be on the site of the work and necessary therefor.

23. Notice and Service Thereof:

(a) Any notice to any Contractor from the Owner relative to any part of this contract shall be in writing and considered delivered and the service thereof completed, when said notice is posted by registered mail, to the said Contractor at his last given address, or delivered in person to said Contractor or his authorized representative on the work, or is deposited in the regular United States mail in a sealed, postage prepaid envelope and the receipt thereof is acknowledged by the Contractor.

(b) All papers required to be delivered to the Owner shall, unless otherwise specified in writing to the Contractor, be delivered to the City Clerk, and any notice to or demand upon the Owner shall be sufficiently given if delivered to the office of said Clerk or if deposited in the United States Mail

in a sealed, postage prepaid envelope, or delivered with charges prepaid to any telegraph company for transmission, in each case addressed to said Clerk or to such other representative of the Owner or to such other address as the Owner may subsequently specify in writing to the Contractor for such purposes.

24. Quantities of Estimate: The estimated quantities of work to be done and materials to be furnished under this contract shown in any of the documents including the proposal, are given for use in comparing bids and to indicate approximately the total amount of the contract; and the right is especially reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this contract.

25. Rights-of-Way and Suspension of Work: The Owner will furnish all land and rights-of-way necessary for the carrying out of this contract and the completion of the work herein contemplated and will use due diligence in acquiring said land and rights-of-way as speedily as possible. But it is possible that all lands and rights-of-way may not be obtained as herein contemplated before construction begins, in which event the Contractor shall begin his work upon such land and rights-of-way as the Owner may have previously acquired and no claim for damages whatsoever will be allowed by reason of the delay in obtaining the remaining lands and rights-of-way. Should the Owner be prevented or enjoined from proceeding with the work, or from authorizing its prosecution, either before or after the commencement, by reason of any litigation, or by reason of its inability to procure any lands or rights-of-way for the said work, the Contractor shall not be entitled to make or assert any claim for damage by reason of said delay, or to withdraw from the contract except by consent of the Owner; but time for completion of the work will be extended to such time as the Owner determines will compensate for the time lost by such delay, such determination to be set forth in writing.

26. General Warranty for One Year after Completion of Contract: For a period of at least one year after the completion of the contract, the Contractor warrants the fitness and soundness of all work done and materials and equipment put in place under the contract and neither the final certificate of payment nor any provision in the contract documents nor partial or entire occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the contract documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from the date of final acceptance of the work unless a longer period is specified. The Owner will give notice of observed defects with reasonable promptness.

27. Contractor's Obligations: The Contractor shall and will, in good workmanlike manner, do and perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper and complete all the work required by this contract, within the time herein specified, in accordance with the provisions of this contract and said specifications and in accordance with the plans and drawings of the work covered by this contract and any and all supplemental plans and drawings, and in accordance with the directions of the Engineer as given from time to time during the progress of the work. He shall furnish, erect, maintain, and remove such construction plant and such temporary works as may be required. He alone shall be responsible for the safety, efficiency, and

adequacy of his plant, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance, or operation. The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements, and limitations of the contract and specifications, and shall do, carry on, and complete the entire work to the satisfaction of the Engineer and the Owner.

28. Engineer's Authority: The Engineer shall give all orders and directions contemplated under this contract and specifications relative to the execution of the work. The Engineer shall determine the amount, quality, acceptability and fitness of the several kinds of work and materials which are to be paid for under this contract and shall decide all questions which may arise in relation to said work and the construction thereof. The Engineer's estimates and decisions shall be final and conclusive, except as herein otherwise expressly provided. In case any question shall arise between the parties hereto relative to said contract or specifications, the determination or decision of the Engineer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected in any manner or to any extent by such question.

The Engineer shall decide the meaning and intent of any portion of the specifications and of any plans or drawings where the same may be found obscure or be in dispute.

Any differences or conflicts in regard to their work which may arise between the Contractor under this contract and other contractors performing work for the Owner shall be adjusted and determined by the Engineer.

29. Prohibited Interests: No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part hereof. No officer, employee, architect, attorney, engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

30. Evidence of Payment: The Contractor shall furnish the Owner, whenever requested, with satisfactory evidence that all persons who have done work, or furnished materials under this agreement have been duly paid or satisfactorily secured. In case such evidence is not furnished as aforesaid, such amounts as may be necessary to meet the claim of such unsatisfied person may be retained from moneys due the Contractor under this contract, until the liabilities aforesaid shall be fully discharged.

31. Acceptance of Work and Final Payment: Before final acceptance of the work and payment to the Contractor of the percentage retained by the Owner, the following requirements shall be complied with.

(a) Final Inspection: Upon notice from the Contractor that his work is completed, the Engineer will make a final inspection of the work, and shall

notify the Contractor of all instances where his work fails to comply with the contract drawings and specifications as well as any defects he may discover. The Contractor shall immediately make such alterations as are necessary to make the work comply with the contract drawings and specifications, and to the satisfaction of the Engineer.

(b) Operating Test: After the alterations for compliance with the contract drawings and specifications have been made, and before acceptance of the whole or any part of the work, it shall be subjected to test to determine that it is in accordance with the contract drawings and specifications. The Contractor shall maintain all work in first-class condition for a thirty (30) day operating period after the work has been completed as a whole, the final inspection has been made and the Engineer has notified the Contractor in writing that the work has been finished to his satisfaction. Necessary power, chemicals and materials required for operation will be furnished by the Owner during the specified operating period. The retained percentage as provided herein will not become due or payable to the Contractor until after the thirty (30) days operating period has expired.

(c) Cleaning Up: Before the work is considered as complete, all rubbish and unused material due to or connected with the construction must be removed and the premises left in a condition satisfactory to the Owner. Streets, curbs, cross-walks, pavements, sidewalks, fence and other public and private property disturbed or damaged shall be restored to their former condition. Final acceptance will be withheld until such work is finished.

(d) Liens: Final acceptance of the work will not be granted and the retained percentage will not be due or payable until the Contractor has furnished the Owner proper and satisfactory evidence under oath that all claims for labor and material employed or used in the construction of the work under this contract have been settled, and that no legal claims can be filed against the Owner for such labor or material.

(e) Final Estimate: Upon completion of all cleaning up, alterations, and repairs required by the final inspection or operating test, the satisfactory completion of the operating test, and upon submitting proper and satisfactory evidence to the Owner that all claims have been settled, the Engineer will issue a certificate of final acceptance of the work. The Contractor shall then prepare his final estimate. After review and approval of the final estimate by the Engineer, the Owner and representatives of the U. S. Public Health Services, and State Health Department, the payment shall then become due.

32. Acceptance of Final Estimate: The acceptance by the Contractor of the final estimate, shall operate as a release to the Owner from all claims and liabilities to the Contractor for all work done or materials furnished, or for any act of the Owner or its agents affecting the work.

"ANTI-KICKBACK" ACT, COPELAND ACT

TITLE 18, U.S.C.

§ 874. Kickbacks from public works employees:

"Whoever, by force, intimidation, or threat of procuring dismissal from employment, or by any other manner whatsoever induces any person employed in the construction, prosecution, completion or repair of any public building, public work, or building or work financed in whole or in part by loans or grants from the United States, to give up any part of the compensation to which he is entitled under his contract of employment, shall be fined not more than $5,000 or imprisoned not more than five years, or both."

/18 U.S.C. 874 (June 25, 1948, ch. 645, § 1, 62 Stat. 740, eff. Sept. 1, 1948) replaces the former § 1 of the Copeland Act of June 13, 1934 (48 Stat. 948), which was codified as 40 U.S.C. 276b prior to its repeal by 62 Stat. 862, eff. Sept. 1, 1948/

TITLE 40 U.S.C. (as amended)

§ 276c. Same; regulations governing contractors and subcontractors:

"The Secretary of Labor shall make reasonable regulations for contractors and subcontractors engaged in the construction, prosecution, completion or repair of public buildings, public works or buildings or works financed in whole or in part by loans or grants from the United States, including a provision that each contractor and subcontractor shall furnish weekly a sworn affidavit with respect to the wages paid each employee during the preceding week."

/40 U.S.C. 276c, as amended (48 Stat. 948, as amended by 62 Stat. 862 and 63 Stat. 108) constitutes the Copeland Act in its present form, which is a revision of section 2 of the original Act of June 13, 1934. Section 1 of the original Act was repealed coincidentally with its replacement by 18 U.S.C. 874, set out above./

Reorganization Plan No. 14 of 1950 (15 F.R. 3176, 64 Stat. 1267, 5 U.S.C. 133z note):

"In order to assure coordination of administration and consistency of enforcement of the labor standards provision of each of the /foregoing and other enumerated/ Acts by the Federal agencies responsible for the administration thereof, the Secretary of Labor shall prescribe appropriate standards, regulations, and procedures, which shall be observed by these agencies, and cause to be made by the Department of Labor such investigations, with respect to compliance with and enforcement of such labor standards, as he deems desirable,..."

(SOL-56-275)

ANTI-KICKBACK REGULATIONS (29 CFR, Part 3)

Issued pursuant to Act of June 13, 1934, as amended, 48 Stat. 948; 62 Stat. 740; 63 Stat. 108 (18 U. S. C. 874; 40 U. S. C. 276c), and published in Federal Register February 4, 1942 (including amendments published February 11, 1942, April 4, 1942, May 6, 1942, June 20, 1945, and February 5, 1948).

TITLE 29—LABOR

SUBTITLE A—OFFICE OF THE SECRETARY OF LABOR

Part 3—Anti-Kickback Regulations [Regulations Applicable to Contractors and Subcontractors on Public Building and Public Work and on Building and Work Financed in Whole or in Part by Loans or Grants From the United States]

Sec.

3.1 Purpose and scope.
3.2 Definitions.
3.3 Weekly affidavit with respect to payment of wages.
3.4 Submission of weekly affidavits and the preservation and inspection of weekly payroll records.
3.5 Payroll deductions.
3.6 Regulations part of contract.
3.7 Opinions relating to the regulations.
3.8 Existing regulations superseded: Effective date.
3.9 Delegation to the Solicitor of Labor.

AUTHORITY: 3.1 to 3.7 issued under R. S. 161, sec. 2, 48 Stat. 948; 5 U. S. C. 22, 40 U. S. C. 276c. Interpret or apply sec. 1, 48 Stat. 948, 49 Stat. 1011, as amended; 40 U. S. C. 276a–276a-7, 276b.

§ 3.1 *Purpose and scope.* (a) The regulations in this part are promulgated to aid in the enforcement of the Copeland Act (48 Stat. 948, as amended) and to effectuate the purpose of the Davis-Bacon Act (49 Stat. 1011, as amended) and certain other statutes concerning rates of pay for labor;

(b) The regulations in this part shall be applicable within the geographical limits of the States of the Union, the District of Columbia, the Territory of Alaska, and the Territory of Hawaii.

[7 F. R. 687]

§ 3.2 *Definitions.* As used in the regulations in this part:

(a) The terms "building" or "work" generally include construction activity as distinguished from manufacturing, furnishing of materials, or servicing and maintenance work. The terms include, without limitation, buildings, structures, and improvements of all types, such as bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, railways, ships, vessels, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals; dredging, shoring, scaffolding, drilling, blasting, excavating, clearing, and landscaping. Unless conducted in connection with and at the site of such a building or work as is described in the foregoing sentence, the manufacture or furnishing of materials, articles, supplies, or equipment (whether or not a Federal or State agency acquires title to such materials, articles, supplies, or equipment during the course of the manufacture or furnishing, or owns the materials from which they are manufactured or furnished) is not a "building" or "work" within the meaning of the regulations in this part.

(b) The terms "construction," "prosecution," "completion," or "repair" mean all types of work done on a particular building or work at the site thereof, including, without limitation, altering, remodeling, painting and decorating, the transporting of materials and supplies to or from the building or work by the employees of the construction contractor or construction subcontractor, and the manufacturing or furnishing of materials, articles, supplies, or equipment on the site of the building or work, by persons employed at the site by the contractor or subcontractor.

(c) The terms "public building" or "public work" include building or work for whose construction, prosecution, completion, or repair, as defined above, a Federal agency is a contracting party, regardless of whether title thereof is in a Federal agency.

(d) The term "building or work financed in whole or in part by loans or grants from the United States" includes building or work for whose construction, prosecution, completion, or repair, as defined above, payment or part payment is made from funds of any Federal agency and for which a Federal or State agency is a contracting party, or for which minimum wages are predetermined by Federal, State, or local agencies.

(e) Every person paid by a contractor or subcontractor in any manner for his labor in the construction, prosecution, completion, or repair of a public building or public work or building or work financed in whole or in part by loans or grants from the United States is "employed" and receiving "wages," regardless of any contractual relationship alleged to exist between him and the real employer.

(f) The term "any affiliated person" includes a spouse, child, parent, or other close relative of the contractor or subcontractor; a partner or officer of the contractor or subcontractor; a corporation closely connected with the contractor or subcontractor as parent, subsidiary, or otherwise, and an officer or agent of such corporation.

(g) The term "Federal agency" means the United States, the District of Columbia, and all executive departments, independent establishments, administrative agencies, and instrumentalities of the United States and of the District of Columbia, including corporations, all or substantially all of the stock of which is beneficially owned by the United States, by the District of Columbia, or any of the foregoing departments, establishments, agencies, and instrumentalities.

[7 F. R. 687, as amended at 7 F. R. 925, 2591, 3358]

§ 3.3 *Weekly affidavit with respect to payment of wages.* (a) As used in this section, the term "employee" shall not apply to persons in classifications higher than that of laborer or mechanic and those who are the immediate supervisors of such employees.

(b) Each contractor or subcontractor engaged in the construction, prosecution, completion, or repair of any public building or public work, or building or work financed in whole or in part by loans or grants from a Federal agency, shall furnish each week a sworn affidavit with respect to the wages paid each of its employees engaged on work covered by these regulations during the preceding weekly payroll period. The affidavit shall be executed and sworn to by the contractor or subcontractor or by an authorized officer or employee of the contractor or subcontractor who supervises the payment of wages, and shall be in the following form:

STATE OF ______________________________

COUNTY OF ______________________________

I, ____ (Name of party signing affidavit) ____ (title), being duly sworn, do depose and say: That I pay or supervise the payment of the persons employed by ____ (contractor or subcontractor) on the ______________________________________ (building or work); that during the payroll period commencing on the ____________________ day of ________________________________, 195__ and ending the ____________________ day of ______________________, 195__, all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said ____ (contractor or subcontractor) from the full weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full weekly wages earned by any person, other than permissible deductions, as defined in the regulations under the "Kick-back" Act (48 Stat. 948) and described below:

(Paragraph describing deductions, if any)

____

(Signature and title)

Sworn to before me this ____________ day of ____________________, 195__.

(c) Upon a written finding by the head of a Federal agency, the Secretary of Labor may provide reasonable limitations, variations, tolerances, and exemptions from the requirements of this section subject to such conditions as the Secretary of Labor may specify.

[7 F. R. 687, as amended at 13 F. R. 524]

§ 3.4 *Submission of weekly affidavits and the preservation and inspection of weekly payroll records.* (a) Each weekly affidavit shall be delivered by the contractor or subcontractor, within seven days after the regular payment date of the payroll period, to a representative of a Federal or State agency in charge at the site of the building or work, or, if there is no representative of a Federal or State agency at the site of the building or work, the affidavit shall be mailed by the contractor or subcontractor, within such time, to a Federal or State agency contracting for or financing the building or work. After such examination and check as may be made, such affidavit, or a copy thereof, together with a report of any violation, shall be transmitted to the United States Department of Labor at Washington 25, D. C., unless otherwise arranged with the Department of Labor.[1]

(b) Each contractor or subcontractor shall preserve his weekly payroll records for a period of three years from date of completion of the contract. The payroll records shall set out accurately and completely the name, occupation and hourly wage rate of each employee, hours worked by him during the payroll period, the full weekly wages earned by him, any deductions made from such weekly wages, and the actual weekly wages paid to him. Such payroll records shall be made available at all times for inspection by the contracting officer or his authorized representative.

[7 F. R. 687, as amended at 13 F. R. 524]

§ 3.5 *Payroll deductions.* (a) Deductions for the following purposes are permissible:

(1) Where required by Federal, State, or local statutes or ordinances to be made by the employer from the wages earned by the employee;

(2) Bona fide prepayment of wages without discount or interest;

(3) Deductions required by court process provided that the contractor or subcontractor will not be permitted to make such a deduction in favor of the contractor, subcontractor, or any affiliated person or where collusion or collaboration exists.

(b) Any deduction is also permissible which in fact meets the following standards and with respect to which the contractor or subcontractor shall have made written application by registered mail to the Secretary of Labor, a copy of which application shall be sent to the contracting agency by the contractor or subcontractor, setting forth all the pertinent facts indicating that such deductions will meet the following standards:

(1) That such deduction is not prohibited by other law; and

(2) That such deduction is (i) voluntarily consented to by the employee in writing and in advance of the period in which the work was done, and that consent to the deduction is not a condition either for the obtaining of or for the continuance of employment; or (ii) that such deduction is for the benefit of the employees or their labor organization through which they are represented and is provided for in a bona fide collective bargaining agreement; and

(3) That from such deduction no payment is made to, nor profit or benefit is obtained directly or indirectly by the contractor or subcontractor or any affiliated person and that no portion of the funds, whether in the form of a commission or otherwise, will be returned to the contractor or subcontractor or to any affiliated person; and

(4) That the convenience and interest of the employees are served thereby, and that such or similar deductions have been customary in this or comparable situations.

(c) After application in good faith, the deduction may be made in accordance with the foregoing standards: *Provided, however,* That if the Secretary of Labor, on his own motion, or on the application of any person or agency affected by the granting of the application, shall conclude at any time, after written notice to the applicant and an opportunity for him to present his views in support of the deduction, that the deduction has not met the foregoing standards, such deduction shall cease to be "permissible" seven days after the applicant and the Federal agency concerned have been notified of the Secretary's decision.

(d) Upon application to and prior written permission from the Secretary of Labor, and subject to the standards set forth in paragraph (b) (1), (2) and (4) of this section, deductions may be made by a contractor or subcontractor or any affiliated person, for membership fees in group benefit or retirement associations; for board and lodging; or for other purposes where the Secretary of Labor concludes the deduction is required by compelling circumstances: *Provided, however,* The contractor, subcontractor, or any affiliated person does not make a profit or benefit directly or indirectly from the deduction. A copy of the Secretary's decision shall be sent to the applicant and the Federal agency concerned.

(e) In accordance with and subject to the standards set forth in subparagraphs (1) through (4) of paragraph (b) of this section, general permission is hereby granted to make payroll deductions for:

(1) The payment of the purchase price of United States Defense Stamps and Bonds and United States Tax Savings Notes;

(2) The repayment of loans to or the purchase of shares in credit unions organized and operated in accordance with District of Columbia, Federal, or State credit union statutes;

(3) Contributions to a Federal governmental or quasi-governmental agency;

(4) The payment of dues or premiums to unaffiliated insurance companies or associations for medical or hospitalization insurance where the employer is not required by Federal, State or local laws to supply such insurance or benefits.

(5) Contributions to the Red Cross and to Community Chests.

(6) Regular union initiation fees and membership dues where a collective bargaining agreement provides for such deductions. This does not include work permits or special assessments. [(5) and (6) added on March 17, 1955; 20 F. R. 1765.]

(f) In any case in which the employee does not have full and actual freedom of disposition of his wage payment, whether made in cash or by check, any restricted payment made to the employee is considered a deduction under the regulations in this part.

(g) Nothing herein shall be construed to permit any deduction which the contractor or subcontractor knew, or in the exercise of good faith should have known, did not meet the foregoing standards. In order to insure compliance with this section, the Secretary of Labor may notify the contractor or subcontractor that the deduction will be permitted only if certain conditions with respect thereto are observed. The contractor or subcontractor or any affiliated person shall also comply with such general rules and regulations concerning the deductions as the Secretary of Labor shall make from time to time, notice of which shall have been given to the contractor or subcontractor or any affiliated person making the deduction and to the Federal agency concerned either directly or through publication in the FEDERAL REGISTER.

[7 F. R. 687, as amended at 10 F. R. 7393]

§ 3.6 *Regulations part of contract.* All contracts made with respect to the construction, prosecution, completion, or repair of any public building or public work or building or work financed in whole or in part by loans or grants from the United States covered by the regulations in this part shall expressly bind the contractor or subcontractor to comply with such of the regulations in this part as may be applicable.

[7 F. R. 687, as amended at 7 F. R. 925]

§ 3.7 *Opinions relating to the regulations.* The Secretary of Labor will furnish an opinion regarding the coverage of any specific project or with respect to the application of any provision of the regulations in this part at the request of any Federal or State agency.

§ 3.8[2] *Existing regulations superseded: Effective date.* The regulations in this part shall supersede all existing regulations issued under the Copeland Act on April 30, 1942, shall govern all new contracts and all uncompleted portions of contracts and subcontracts which were awarded subsequent to June 13, 1934: *Provided, however,* That parties to such contracts or subcontracts may comply with the regulations in this part before April 30, 1942.

§ 3.9[2] *Delegation to the Solicitor of Labor.*—The Secretary of Labor, in General Order No. 7, dated December 28, 1945, has delegated to the Solicitor of Labor his functions in connection with all correspondence, conferences, and matters relative to the administration and interpretation of the Copeland Act.

Secretary of Labor.

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[1] Section 5.6 (d) of 29 CFR, Part 5 requires that certified payrolls and affidavits of contractors and subcontractors shall be preserved by the Federal agencies for a period of three years from the date of the completion of the contract. This obviates the necessity of sending such payrolls and affidavits to the Department of Labor, unless they are specifically requested.

[2] Not codified in CFR.

DIVISION ONE AND TWO

SECTION NO. 1

GENERAL REQUIREMENTS FOR CONSTRUCTING SEWAGE TREATMENT PLANT AND INTERCEPTOR AND TRUNK SEWERS

1.01 Scope: This section of specifications covers the general requirements for work to be done and the special provisions pertaining to such work under this contract.

1.02 Contract Drawings: The set of drawings entitled "City of Athens," Georgia, Sewerage System Improvements, Contract A, Division One, Sheets 1 through 27, dated July 1960; and Division Two, Sheets 1 through 6, dated July 1960; shall form a part of this contract.

1.03 Specifications: The specifications for work to be done shall form a part of this contract and they will include this section of specifications and Sections 2 through 17 as follows:

Section	Title of Section
2	Control of Materials
3	Site Preparation, Excavating, Backfilling, Grading and Grassing
4	Concrete Work
5	Reinforcing Steel, Structural Steel and Miscellaneous Metal
6	Sewers and Appurtenances (DIVISION ONE)
7	Metal Pipe, Fittings, Valves and Gates
8	Roadways, Walks, Fencing, Filter Stone and Filter Media, Sludge Bed Media and Drains
9	Buildings
10	Mechanical Equipment
11	Centrifugal Sewage Pumps, Sump Pumps, Water Seal Pumps and Sludge Pumps
12	Raw Sewage Pump Control Equipment
13	Control, Instrumentation and Air Compressors
14	Chlorination Equipment
15	Electrical Work
16	Waterproofing and Painting

Section	Title of Section
17	Sewers and Appurtenances (DIVISION TWO)

1.04 Work to be Done: The work to be done under the contract is as follows:

(a) Division One: The work to be done under Division One of this contract consists of furnishing all materials and equipment and performing all labor necessary for construction of a sewage treatment plant of 5.0 M.G.D. average flow capacity and a chlorination building, complete, including excavation, backfilling, grading, sub-structures, superstructures, mechanical equipment, electrical work, painting and all other work and appurtenances shown on the drawings and/or specified for completion of the work.

(b) Division Two: The work to be done under Division Two of this contract consists of furnishing all materials and equipment and performing all labor necessary for construction of interceptor and trunk sewers complete, including clearing, grubbing, excavating, sheathing, backfilling, foundations, manholes, and all other work and appurtenances shown on the drawings and/or specified for completion of the work.

1.05 Working Drawings: The Contractor's attention is directed to the requirements of the section, "Instructions to Bidders and Special Provisions", with reference to working drawings. The Contractor shall submit six copies of drawings and details covering the following items of work, and such other items which may be necessary for the successful completion of this contract, to the Engineer for checking and approval.

1. Reinforcing Steel, Structural Steel and Miscellaneous Metal
2. Windows and Doors
3. Piping Layouts, including Small Piping Layouts
4. Mechanical Equipment
5. Centrifugal Sewage Pumps, Sump Pumps, Water Seal Pumps, and Sludge Pumps
6. Raw Sewage Pump Control Equipment
7. Chlorination Equipment
8. Control and Instrumentation
9. Electrical Equipment
10. Bronze Recording Tablet

No fabrication, erection or installation of work listed above shall commence until drawings and details have been approved by the Engineer.

(a) Check by Contractor: The Contractor shall check all shop drawings and working drawings for accuracy of dimensions and details and for conformation with contract drawings and specifications before submitting such drawings to the Engineer for approval. The Contractor shall indicate that shop and working drawings as outlined above have been checked by him by an appropriate stamp or notation on the face of such drawings.

(b) Responsibility for Accuracy: Approval by the Engineer of the Contractor's working drawings does not relieve the Contractor for accuracy of dimensions and details. The Contractor shall be responsible for agreement and conformity of working drawings with contract drawings and specifications.

1.06 Bronze Recording Tablets: There shall be furnished and installed one Bronze Recording Tablet, to be in a location as directed by the Engineer, and as follows:

(a) Castings: Castings shall be of bronze, of virgin material, free from pits, blow holes or hidden imperfections. The tablet shall have a minimum thickness of not less than three-eighths (3/8") of an inch. The borders and all lettering shall be raised approximately one-eighth (1/8") of an inch. The borders shall be approximately three-eighths (3/8") of an inch wide. The outside dimensions of the new tablet shall be approximately twenty-four (24") inches wide by thirty (30") inches high. Project caption, names of City officials, Contractors, Engineers, border and letters shall be hand chased and burnished. The field shall be of dull pebble finish. The finished work shall be protected with finest transparent lacquer. The tablet shall be fastened upon a masonry wall face in a location to be selected by the Engineer. The tablet shall be furnished with suitable expansion shields and bolts with rosette covers. The lettering shall be of varying sizes. Letters shall be flat-faced Roman raised approximately one-eighth (1/8") of an inch, and shall be consistent with established practice for first-class commercial tablet work. The Engineer will furnish typewritten copy of the desired caption, names and arrangements of lettering.

(b) Drawings: The manufacturer shall be required to furnish full shop drawings or rubbings for verification and approval by the Engineer before casting.

1.07 Cleaning Up: Upon completion of the work, all excess material and rubbish must be removed from the site of the work and disposed of as directed by the Engineer. The surrounding construction area shall be left in essentially as good a condition as existed before the work was done.

1.08 Payment: No separate payment will be made for work under this section of specifications. The cost of all such work and all costs incidental thereto shall be included in the amount bid for the item to which the work pertains.

DIVISIONS ONE AND TWO

SECTION NO. 2

CONTROL OF MATERIALS

2.01 Source of Supply and Quality of Materials: The source of supply for all materials and equipment shall be submitted to the Engineer for approval before orders are placed. Suppliers of reinforcing steel, fabricated metal work and metal castings may be required to submit guarantees of conformity with plans and specifications. Representative preliminary samples of the character and quantity prescribed shall be submitted by the Contractor or producer for examination and tested in accordance with the methods referred to under Samples and Tests. Only materials conforming to the requirements of the Specifications and approved by the Engineer shall be used in the work. All materials proposed to be used may be inspected or tested at any time during their preparation and use. If, after trial, it is found that sources of supply which have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish material from other approved sources. No material, which after approval has in any way become unfit for use, shall be used in the work.

2.02 Samples and the Testing of Materials: Unless otherwise provided for, standard tests of materials will be made in accordance with the Specifications and tests of the American Society for Testing Materials, by a commercial testing laboratory approved by the Engineer, and reports of such test will promptly be furnished to the Engineers. Tests will be arranged by the Contractor unless otherwise directed by the Engineers. The cost of all tests will be paid for by the Owner.

2.03 Schedule of Materials and Standard Tests: The following schedule of materials and the standard tests to which each is to be subjected are given for the Contractor's guidance.

CEMENT:

(a) Less than carload lots - The brand of a mill in successful operation for at least one year.

(b) 1 car to 5 cars - Certificate of mill test to be furnished by producers of laboratory tests made as per A.S.T.M. Designation C150-55 or Fed. Spec. SS-C-158.

SAND: For use in Cement Concrete:

(a) 10 tons to 100 tons - Field tests only:
  (1) Color for organic matter
  (2) Decantation test for silt
  (3) Sieve analysis

(b) For each additional 100 tons - Independent Laboratory tests to indicate conformity with A.S.T.M. Designation C33-55T, as amended to date or Fed. Spec. SS-A281A.

STONE AND GRAVEL: For use in Cement Concrete: (Coarse aggregate)

(a) 10 tons - 200 tons - Similar to Sand (a)
(b) Each additional 200 tons - Similar to Sand (b)

CONCRETE:

Preliminary Tests	Job Tests
Cylinder Compression Tests of concrete made of cement and aggregate proposed to be used in the work; in accordance with A.S.T.M. Designation C39-44	Cylinder Compression Tests of concrete placed in the work, from samples taken at two different times during any major pour of Structural concrete; in accordance with A.S.T.M. Designation C39-49.

Preliminary tests shall include at least two cylinders; one to be broken at 7 days and one at 28 days.

Job tests shall include at least four cylinders for each test; two to be properly stored at the site; and two for laboratory tests, one to be broken at 7 days and one at 28 days.

BRICK (Building):

(a) 1 to 5 Thousand - Visual inspection for shape, color soundness, freedom from cracks, balls of clay or particles of lime.

(b) For each additional 50 Thousand or part thereof - Absorption test and either compression or flexure tests, A.S.T.M. Designation C67-50 by an independent laboratory

BUILDING STONE:

(a) 1 to 5 Tons - Visual inspection for shape and color

(b) For each additional 5 Tons or part thereof - Same as (a); also, tests for absorption and compression as per A.S.T.M. Designation C97-47 and C170-50.

VITRIFIED CLAY SEWER PIPE:

(a) Any quantity - For shape, cracks, blisters, absence of vitrification; hammer test.

(b) Any quantity - Laboratory tests in amounts and character as per A.S.T.M. Designation C13-54 and C200-55T as amended to date.

FILTER UNDERDRAIN TILE:

(a) Any quantity - Laboratory tests in amount and character as per A.S.T.M. Designation C159-55.

CONCRETE SEWER PIPE: Non reinforced and Reinforced Concrete Sewer Pipe and Culvert Pipe.

(a) Any quantity - Visual inspection for shape, uniformity, density; hammer test. Each pipe to be inspected and stamped by a regular employee of the approved testing laboratory.

(b) Any quantity - Laboratory tests in amounts and character as per A.S.T.M. Designation C14-55, C75-55 and C76-55, also permeability test for all pipe of all designations in accordance with tentative revision of C14-55:19 as outlined in editorial note at end of C14-55. Refer to Engineer for completeness of tests. Retain selected samples of pipe on project for guidance of inspectors.

CAST IRON PIPE, DUCTILE IRON PIPE AND SPECIAL CASTINGS:

(a) Any quantity - Certified tests furnished by foundry, field tests for dimensions, coating and holes; hammer test.

STRUCTURAL STEEL:

(a) Any quantity - Field inspection for rust, shape and dimensions.

(b) 25 to 200 Tons - Independent shop inspection and certified copies of mill tests.

(c) For Bridges and Buildings - See A.S.T.M. Designation A7-55T.

CONCRETE REINFORCEMENT STEEL:

(a) Up to 50 Thousand Lbs. - Field inspection for rust, shape and dimensions.

(b) 50 Thousand Lbs. and up - Independent laboratory inspection as follows:

(1) Billet Steel - A.S.T.M. Designation A15-54T.

(2) Rail Steel - A.S.T.M. Designation A16-54T.

(3) Cold-drawn Steel Wire - A.S.T.M. Designation A82-34.

(4) Wire Fabric - A.S.T.M. Designation A185-54T.

DIVISION ONE

SECTION NO. 3

SITE PREPARATION, EXCAVATING, BACKFILLING, GRADING AND GRASSING

3.01 Scope: The work covered by this section consists of furnishing all materials and equipment and performing all labor necessary for clearing, excavating, backfilling, grading and grassing for site development and construction of the structures shown on the accompanying plans. All work will be done in strict conformity with the specifications and the directions of the Engineers.

3.02 Site Conditions: The Contractor's attention is directed to paragraphs of Instructions to Bidders and Special Provisions relating to Site Examination.

3.03 Clearing Site: The site shall be cleared of all obstructions interfering with the construction of new work. The area shall be cleared of trees, stumps, roots, brush, rubbish and other such materials to at least 10 feet beyond fence line. Trees and shrubs designated to be left in place, and those outside of construction limits, shall not be damaged.

(a) Disposal of Waste Materials: All materials resulting from clearing operations shall be burned or otherwise disposed of in a satisfactory manner. Materials to be burned shall be neatly piled, and when in a suitable condition, shall be completely burned. Trees within the limits of the area to be cleared which are suitable for timber or pulpwood shall become the property of the Contractor.

(b) Damage to Existing Facilities: All structures, pavements, fences, or other such facilities which are removed or damaged by construction operations, but not in the way of new work, shall be replaced or repaired at Contractor's expense.

3.04 Stripping: The Contractor shall strip the entire area within cut, fill and graded areas to remove all top soil, vegetable matter, stumps, roots, and other objectionable materials. Top soil and vegetable matter shall be carefully stockpiled and preserved for surfacing fill slopes. Roots and stumps shall be grubbed out and burned or removed from the property entirely. The base of all embankments and fills shall be scarified and rolled so that the base will be well bonded with the first layers of fill.

3.05 Grading: Before the beginning of construction operations, the area upon which the structures and buildings are to be located shall be graded to conform, in general, with finish elevations shown on the drawings.

(a) Additional Material: If additional material, other than that to be obtained from excavation, is required for backfilling and grading, the Contractor shall obtain such additional material from borrow, on the site, as directed by the Engineer.

(b) Excess Material: All excess earth excavation, and all rock excavation shall be placed on or near the site as directed by the Engineer. Surfaces and slopes of waste fills shall be left smooth and free to drain.

3.06 Excavations: The Contractor shall perform all excavating of every description, and of whatever substances encountered, to the dimensions and levels

shown on the drawings, and/or specified. Excavation may be accomplished by any customary method.

(a) Rock: Rock will not be classified as such for additional payment. The bidder shall satisfy himself as to rock and other materials which may be encountered in excavation, and make proper allowances for all contingencies in his lump sum bid. Any information indicated on the drawings, or otherwise furnished, with reference to drillings made on the plant site are offered as information only. Neither the Owner, nor the Engineer, will be responsible for subsurface conditions found to be otherwise.

(b) Footings: Footings shall be excavated to the depth indicated on the drawings. Footings shall rest on firm undisturbed earth assuring proper bearings.

(c) Method: Excavation may be accomplished by any customary method. If blasting is found to be necessary, the Engineer shall be advised before any explosive is brought on the job and he shall prescribe such precautionary measures as he deems necessary.

(d) Limits: Excavate for a sufficient distance from foundation walls to allow for inspection and to permit the various trades to install their work. Trenches for foundation walls shall be a minimum of two feet wider than the thickness of the walls. Excavation for piers shall be at least two feet greater than the dimensions of the footings. Excavation for footings shall be to the footing dimensions.

(e) Depth: Care shall be taken that excavation does not extend below the exact lines of the footings and floor slabs on ground. Should the excavation, through carelessness or negligence on the part of the Contractor be carried below such lines, the Contractor shall fill in the resulting excess excavation with concrete under walls and footings and with concrete or crushed stone, as directed, under slabs. This work shall be done at the Contractor's expense. Concrete for this purpose shall be of the same quality and mix as that for footings.

(f) Slabs on Earth: Where slabs on earth occur, all loam, organic, or other undesirable material shall be removed as required by the Engineer. When filling is required to bring such excavated area to the levels required to receive slabs, the fill shall be compacted by tamping and rolling to obtain 95% of maximum density. Layers shall be not more than six (6") inches thick. Fill shall be constructed in accordance with the provisions of Section No. 8.

3.07 Blasting: All blasting operations shall be conducted in accordance with existing ordinances and regulations, and shall be done subject to the Engineer's approval of the method and quantity of explosive to be used. Exposed structures shall be protected from the effects of blasts and blasts shall be covered with suitable mats, and shall be restricted to the extent that no appreciable shock will be transmitted to existing structures, pipe lines, sewers or other public or private facilities. All blasting supplies shall be stored in a manner approved by the Engineer and a watchman shall be stationed at all times at the place of storage.

3.08 Water and Uplift: The Contractor shall by the use of well points, pumps, or other approved methods, prevent the accumulation of water in excavated

areas. Should water accumulate it shall be promptly removed. The Contractor shall also provide for dewatering areas adjacent to uncompleted structures to prevent uplift during construction operations. The Contractor will be held responsible for any damage due to uplift of such structures during construction operations.

3.09 Yard Fills and Backfilling Around Structures: All yard fills and backfills around structures shall be of selected materials properly placed in layers. The layers shall be thoroughly compacted to at least 95% of maximum density, each layer to be not deeper than six (6") inches compacted thickness. Compaction of yard fills shall be by use of heavy sheeps foot roller and until the roller "walks-out." Compaction around structures shall be by use of heavy power tamping equipment. Selected materials shall also be used for backfill around pipe in pipe trenches. Fills shall be constructed in accordance with the provisions of the Section No. 8.

3.10 Finish Grading: Finish grading shall be performed in accordance with the finished elevations and grades shown on the drawings and shall be made to blend into conformation with remaining natural ground surfaces. All finished grading surfaces shall be left smooth and free to drain. The tops of all cuts shall have berm ditches. Selected materials, which have been obtained from stripping the site, shall be spread upon the slopes of fills and other areas to be grassed to a uniform depth and compacted suitably for planting. The spreading of selected materials will not be done until the work of planting is ready to proceed, except as specified in Paragraph 3.12. Excess materials shall be spread and compacted as directed.

3.11 Grassing shall be as follows:

A. Bermuda seed and live sprigs.

B. Domestic (Italian) rye seed, if ordered by Owner.

Grassing with Bermuda shall be done only if it can be completed between May 15 and August 15. Grassing after the above 3-month period and before November 15 shall be done with domestic rye at the Owner's option. The work of grassing shall include all fill slopes within the fenced area.

Bermuda sprigs shall be live, fresh and selected with roots uninjured from sources native to the locality of the work as approved by the Engineer. Sprigs shall be planted in furrows ten inches apart, the furrows to run parallel to contours of the same approximate elevation, sprigs to be eight inches apart in the furrow.

Before planting, a fertilizer of 4:12:4 or other approved composition shall be hand raked into the top soil at a rate of 25 pounds per 1000 square feet and then watered. All sprigs shall be placed within an hour after removal from the location in which they are growing. Ground shall be damp or freshly watered before planting. Sprigs shall be rolled after planting. Hulled Bermuda Seed shall be tamped in on all areas planted with sprigs at the rate of 3 pounds of seed per 1000 square feet of surface area.

All planting and seeding shall be watered thoroughly as soon as completed and shall be watered at least twice daily, or oftener if necessary to provide continuous growth without setback until all growth from seed is thoroughly established.

Domestic (Italian) rye seed, if used, shall be raked in at a rate of 10 pounds per 1000 square feet. Fertilizer and watering shall be the same as for Bermuda.

3.12 Deferred Grassing: If the schedule of construction is such that the work of Bermuda grassing cannot be accomplished before final inspection of all other items in the plant, the Contractor shall obtain a signed proposal to the Owner from an approved local landscaper for the work specified, including watering, to be started by the following May 15. The Owner shall deduct the amount of the proposal from the final payment. The work of spreading and compacting top soil will be performed by the Contractor as specified under Paragraph 3.10 just before final inspection of the plant. Replacing or repairing of eroded top soil will be done when necessary by the local landscaper at time of grassing and this work shall be included in his proposal.

3.13 Limits of Grassing: The areas to be grassed shall include all areas bounded by cut or fill slopes, including the areas north of the digesters and south of the sludge drying beds. All fill slopes shall be grassed. 2:1 cut slopes shall not be grassed; but all other graded areas, whether cut or fill shall be grassed within the limits specified above.

3.14 Borrow Material: If borrow material is required, it shall be obtained from the plant site as directed by the Engineer.

3.15 Waste Materials: Rock and excess materials from excavation which are to be wasted shall be spread on the plant site as directed by the Engineer.

3.16 Payment: Payment for all earth work will be included in the lump sum price stated in the Proposal. Payment for rye grassing and for Bermuda grassing will be included in the lump sum bid price. The Bidder shall list under "Deductions" in the Proposal, the amount to be deducted for the elimination of rye grassing at the Owner's option.

DIVISIONS ONE AND TWO

SECTION NO. 4

CONCRETE WORK

4.01 Scope: The work covered by this section consists of furnishing all materials and equipment and performing all labor necessary for construction of all concrete work, including appurtenances thereto, as indicated on the drawings and/or specified.

4.02 General: Work under this section shall include the installation of all sleeves, inserts, piping, hangers, anchors, frames, or other such items to be built into the concrete work, and all other work and appurtenances specified and/or required for proper execution of the work. All such items shall be correctly positioned and firmly secured in form work and shall be inspected and approved prior to placing of concrete.

4.03 Concrete, Composition, Classification and Strength: Concrete shall be composed of cement, fine aggregate, course aggregate and water, proportioned and mixed to produce a plastic workable mix in accordance with the requirements of these specifications and suitable for the specific conditions of placement.

(a) Classification and Strength: Concrete shall be in three classifications. Minimum 28-day compressive strength and usage shall be as follows:

(1) Class "A": Minimum compressive strength 3000 psi shall be used for all reinforced concrete work, and for un-reinforced footings and slabs 8 inches or less in thickness.

(2) Class "B": Minimum compressive strength 2200 psi shall be used for gravity type walls and for un-reinforced footings and slabs over 8 inches in thickness.

(3) Class "C": Minimum compressive strength 1500 psi shall be used for concrete sub-foundations, pipe envelopes, and for concrete backfill when required.

Compressive strength of concrete at the age of 28 days shall be determined by breaking standard 6-inch diameter by 12-inch test cylinders in accordance with A.S.T.M. C31-55 and C39-49 as amended to date.

4.04 Concrete - High Early Strength: Concrete made with high early strength Portland cement shall be used only when specifically authorized by the Engineer. The compressive strength of such concrete, at the age of 7 days, shall be at least equal to the minimum 28 day compressive strengths specified above. All other provisions of these specifications, except for cement, shall be applicable to such concrete.

4.05 Materials: Materials for use in concrete work, including Admixtures, Aggregates, Cements, Form Material and Water shall be in accordance with the following:

(a) Admixtures: "Pozzolith" as manufactured by the Masters Builders Co. shall be added to all Class "A" concrete in accordance with the manufacturer's directions. A standard Master Builders dispenser for the introduction of "Pozzolith" to the mix and the services of a representative of

the manufacturer to install the dispenser and set up the operation thereof shall be furnished by the Contractor. No admixture is required for Class "B" or Class "C" concrete.

(b) Aggregate - Fine: Fine aggregate shall be natural sand consisting of hard, strong, durable and uncoated particles, and shall conform to the requirements of Federal Specifications SS-A-281a Class 1, Grade A, or A.S.T.M. C-33-55T, as amended to date, with gradation as follows:

Total Passing	Per Cent by Weight
No. 4 Sieve	95 - 100
No. 16 Sieve	45 - 95
No. 50 Sieve	10 - 30
No. 100 Sieve	2 - 10

Fine aggregate shall have a fineness modulus of not less than 2.30 nor more than 3.00. Variation in fineness modulus shall be limited to ±0.20 from the average of all tests.

(c) Aggregate - Coarse: Coarse aggregate shall be washed gravel or crushed stone consisting of hard, strong, durable and uncoated particles, and containing no vegetable matter, nor soft, friable, thin or elongated particles in quantities considered deleterious by the Engineer. Coarse aggregate shall conform to the requirements of Federal Specifications SS-A-281a Class 2, Grade A, or A.S.T.M. C33-55T, as amended to date, with gradation as follows:

Retained On	Per Cent by Weight
1-1/2" Sieve	0
1" Sieve	0 to 15
1/2" Sieve	45 to 70
No. 4 Sieve	95 to 100
No. 16 Sieve	99 to 100

(d) Cement: The cement content of concrete for Class "A" concrete shall consist of 75% Portland cement and 25% blast furnace slag cement measured by volume or may be Portland blast furnace slag cement conforming to A.S.T.M. specifications C205-53.

The cement content of Class "B" and Class "C" concrete shall consist of Portland cement. Cement shall be furnished in accordance with the following:

(1) Portland Cement shall conform to A.S.T.M. Specifications C-150-55 as amended to date.

(2) High Early Portland Cement shall conform to A.S.T.M. Specifications C-150-55, Type III, as amended to date.

(3) Portland Blast-Furnace Slag Cement shall conform to A.S.T.M. Specifications C205-53T, as amended to date.

(4) Slag Cement shall conform to A.S.T.M. Specifications C358-58, Type S.

(e) Form Material: Form materials, including lumber, lining and form ties shall be in accordance with the following:

(1) Class of Material: Forms shall be of plywood, and shall be of grade or type suitable to obtain the kind of finish required. Form lining, as approved by Engineer, shall be used for all exposed surfaces. Metal forms shall not be used unless specifically authorized by the Engineer.

(2) Form Oil: Form oil shall be non-staining mineral oil.

(3) Form Ties: Form ties shall be of the cone nut threaded rod, or standard snaptie type, designed so that when removed no metal will be left closer than 1 inch from the finished wall face. The cavities left in faces of concrete work by removal of form ties shall be pointed up with non-shrink mortar. Form ties shall have a minimum working strength of at least 3,000 lbs. when fully assembled and shall be as approved by the Engineer.

(f) Water: The water used in mixing concrete shall be fresh, clean and free from injurious amounts of oil, acid, alkali, or organic materials.

4.06 Storage: Cement and aggregate stored on the site shall be stored in the following manner:

(a) Cement: Cement shall be stored immediately upon receipt at the site of the work, in a thoroughly dry, weather-tight, properly ventilated building, with adequate provisions for prevention of the absorption of moisture. Storage shall be such as to permit ease of access for inspection, and to permit definite identification of each shipment of cement.

(b) Aggregate: Fine and coarse aggregate shall be stored separately, and in such a manner so as to avoid the inclusion of any foreign material in concrete. Stock piles of coarse aggregate shall be built in horizontal layers to avoid segregation.

4.07 Testing: Testing of materials shall be done by an independent commercial testing laboratory approved by the Engineer. Such tests shall be arranged for by the Contractor and paid for by the Owner. Reports of such tests shall be promptly submitted to the Engineer. Sampling and testing of aggregates, cement and concrete cylinders shall be as specified under the section "Control of Materials" of these specifications, and in accordance with the following:

(a) Sampling and Testing Aggregates: Sampling and testing of aggregates shall be in accordance with the section "Control of Materials" of these specifications. The Contractor shall select the source of the concrete aggregates which he proposes to use in the work, and shall furnish suitable samples of such aggregates to the testing laboratory, at least 30 days in advance of the time of proposed use for testing and preparation of design mix.

(b) Testing Cement: The sampling and testing of cement shall be in accordance with the section "Control of Materials" of these specifications. Cement which has been stored for more than four months after being tested shall be re-tested before use.

(c) Testing Concrete: Concrete cylinders for testing purposes shall be

made in accordance with the procedure set forth in A.S.T.M. C31-55, entitled "Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field", as amended to date. Compression tests of concrete cylinders shall be made at the age of 7 days and 28 days by the testing laboratory in accordance with procedures set forth in A.S.T.M. C39-49 entitled "Standard Methods of Tests for Compressive Strength of Molded Concrete Cylinders", as amended to date, and as required by the Engineer. After beginning work the number of tests shall be as set forth in the following table, but shall be not less than one for each type of concrete for any pour.

Total Cu.Yds. Concrete Placed	Minimum Number Tests
0 to 100	One each pour
100 to 1,000	One each 250 Cu.Yds.
1,000 to 2,000	One each 350 Cu.Yds.
2,000 and over	One each 500 Cu.Yds.

Each test shall consist of at least 4 specimens. Two shall be for field control and two for laboratory control.

(d) Slump Tests: Slump tests of concrete shall be made in the field by the Contractor for each pour with an accurately made sheet iron test cone, in accordance with the provisions of A.S.T.M. Specification C143-52, entitled "Standard Method of Slump Test for Consistency of Portland Cement Concrete." The slump for concrete to be placed in piers and walls shall be not less than 4 inches nor greater than 7 inches. The slump for concrete to be placed in slabs on earth or rock shall be not less than 2 inches, nor greater than 4 inches.

4.08 Design Mix: A design mix for each classification of concrete to be used in the work shall be prepared and tested by the Independent Commercial Testing Laboratory selected by the Contractor and approved by the Engineer for the testing of materials as specified in the paragraph "Testing" above. The design mix shall be prepared using samples of the cement or blend of cements, the admixture if required, and the aggregates to be used in the work. Cement blend and admixture shall be as specified in paragraph 4.05. A minimum of 4 cylinders shall be made from the design mix for each classification of concrete, 2 to be tested at 7 days and 2 to be tested at 28 days. Cylinders shall be made and tested in accordance with A.S.T.M. C31-55 and C39-49, as amended to date.

4.09 Proportioning: Materials used in concrete shall be proportioned so as to produce a workable mixture, having a slump within the required limits, and with a minimum water content.

(a) Control: The exact proportion of materials to be used in concrete shall be as determined by the Laboratory Design Mix, and as directed by the Engineer. The equipment necessary to positively determine and control actual amounts of materials entering into the concrete shall be furnished by the Contractor. The proportions of materials used in the mix shall be changed whenever, in the opinion of the Engineer, such a change is necessary to obtain the required strength, or the desired density for uniformity and workability. In structures intended to be watertight, good workability will be considered to be of primary importance.

(b) Measurement: All materials shall be measured by weight, except for

water, which may be measured by volume. One bag of Portland Cement shall be considered to weigh 94 lbs., one gallon of water to weigh 8.33, and one bag of Slag cement to weigh 79 lbs.

(c) Cement Content: Each cubic yard of concrete shall contain as a minimum the following quantities of cement:

Class "A" - 6 bags or 564 lbs.
Class "B" - 5 bags or 470 lbs.
Class "C" - 4 bags or 376 lbs.

The cement weights above are based on the use of Portland cement; if the use of slag cement is required the quantity of slag cement used shall be 25% by volume of the total cement requirement, and the above weights reduced accordingly.

(d) Water Content: In calculating the total water content of any mix, the amount of water carried on the surface of the aggregate particles shall be included. The total water content per bag of cement, for each batch of concrete shall not exceed 6.0 gallons, unless specifically authorized by the Engineer. The amount of water to be used in the mix shall, in all cases, be the minimum amount necessary to produce a plastic mix, of the required strength, and of the desired density, uniformity, workability, and within the required slump limits.

(e) Aggregate Content: The total volume of aggregates to be used in each cubic yard of concrete, and the proportion of fine aggregate to coarse aggregate shall be that necessary to produce a dense mixture of the required workability, as determined by the Laboratory Design Mix, and as directed by the Engineer.

4.10 Mixing: Concrete to be placed in the work may be proportioned and mixed by the Contractor on the site of the work, or may be proportioned and mixed in a Central Mix Plant, in accordance with the following:

(a) Mixing on Job Site: When concrete is proportioned and mixed on the job site the Contractor shall provide the equipment necessary to positively determine and control the actual amounts of materials entering into the mix. Mixing shall be done in a batch mixer of approved design which will insure a uniform distribution of the material throughout the mass. The entire contents of the drum shall be discharged before recharging. The volume of the mixed material per batch shall not exceed the rated capacity of the machine. The Contractor shall, during the mixing and placing of concrete, have a minimum of two concrete mixers on the site so as to maintain continuity of the pour in the event of mechanical failure of one of the mixers.

(1) Time of Mixing: The mixing of each batch shall continue a minimum of 1-1/2 minutes after all materials are in the mixer, during which time the mixer shall rotate at a peripheral speed of at least 200 feet per minute.

(b) Mixing at Central Plant: When concrete is porportioned and mixed at a central plant, the concrete shall be conveyed to the work in approved mixer trucks, which shall mix the concrete enroute to the work. Plant layout and equipment shall meet the approval of the Engineer, and concrete shall be proportioned, mixed and transported under the following conditions:

(1) Laboratory Representative: The Contractor shall arrange for the services of a representative of an approved testing laboratory, who shall be present at the central mix plant whenever Class "A" concrete is proportioned and mixed for the work, and shall control proportioning and mixing operations, except when otherwise approved by the Engineer. Payment for the services of said laboratory representative will be made by the Owner. If concrete is cancelled, Contractor shall pay for above services.

(2) Loading Tickets: Loading tickets shall be initialed by the laboratory representative, and the time of loading stamped thereon. Such tickets shall be handed to the inspector upon arrival of the mixer truck on the job site, before placing the load. Batch weights also shall be noted thereon by laboratory representative.

(3) Transporting: Concrete must be transported to the site of the work in approved mixer trucks, which will mix the concrete enroute. In extreme hot weather, when approved by the Engineer, the required amount of water may be added to the mix upon arrival of the truck at the work, in order to avoid pre-set of the mix during the time the mixer truck is enroute.

(4) Specifications: The mixing and handling of ready mixed concrete, except as otherwise specified above shall conform to the requirements of A.S.T.M. Specifications C94-55T, as amended to date. In the event the above conditions are not complied with such concrete will be subject to rejection.

4.11 Placing Concrete: Before concrete is placed the depth and character of the foundations, the adequacy of forms and falsework, the placing of steel and appurtenant work shall be inspected and approved by the Engineer; such approval, however, shall not relieve the Contractor of the responsibility to produce the finished work. Preparation for placing concrete, and the handling and placing of concrete, shall be in accordance with the following:

(a) Preparation: All accumulated water and debris shall be removed from excavations, or from form work into which concrete is to be placed, and any flow of water into such places shall be diverted into side drains or sumps, so as to be removed without disturbing newly placed concrete. Forms, unless lined, shall be thoroughly wetted with water before concrete is placed so as to tighten joints and prevent leakage from the mix. Runways for buggies or wheelbarrows, if used, shall not be supported on form work. Concrete shall be conveyed in such a manner so as not to disturb forms.

(d) Daylight Placing: All concrete shall be placed in daylight, and the placing of concrete in any portion of the work shall not be begun if such work cannot be completed during daylight, unless otherwise specifically approved by the Engineer. Such approval will not be given unless an adequate lighting system is provided.

(c) Cold Weather Placing: Concrete shall not be placed when the atmospheric temperature is below 35 degrees Fahrenheit. If after placing concrete the temperature drops below 35 degrees Fahrenheit, the Contractor shall enclose, heat and protect the work in such a manner so as to keep the air surrounding the fresh concrete at a temperature of not less than 45 degrees Fahrenheit for a period of 5 days after concrete is placed. The Contractor shall assume all risk connected with the placement and protection of concrete under the above, and should such concrete be

unsatisfactory, it shall be rejected.

(d) Handling: Concrete shall be transported from the mixer to the point of deposit by a bottom dump concrete bucket handled by a crane, by concrete buggies, or by wheelbarrows. In the event the quality of the concrete as it reaches the forms, or the method and placing thereof, in the opinion of the Engineer, are not satisfactory, the Contractor shall change his method of operation so as to place concrete in a satisfactory manner.

(e) Placing: Concrete shall be placed in such a manner so as to avoid the possibility of segregation or separation of aggregates, so as to avoid displacement of reinforcing, and to avoid coating or splattering the reinforcing steel which is in place, with concrete which may set before completion of the pour, and tend to reduce bond. Troughs, pipes, hoppers and chutes and canvas tremies used in placing concrete shall be arranged and used so as to place the concrete in the manner specified. The placing of concrete within form work shall be regulated so that the pressure within form work caused thereby shall not exceed the design pressure thereof. Concrete shall be placed in continuous horizontal layers the thickness of which, in general, shall not exceed 12 inches. In placing concrete each batch and each layer shall be placed following the preceding batch or layer so closely that there will be no lines of separation or "cold joints" in the work. Care shall be used to fill each part of the forms by depositing concrete as near final position as possible. After the concrete has taken its initial set care shall be used to avoid jarring the form work or placing strain or vibration on the ends of projecting reinforcing bars.

(1) Compaction: Concrete, as placed in layers shall be compacted by the use of mechanical internal vibrating equipment, supplemented by hand spading with a steel splicing rod. Vibrating shall not be used to transport concrete within forms. Internal vibrators shall maintain a speed of at least 5000 impulses per minute when submerged in concrete. At least one spare vibrator shall be maintained on the job site as a relief. The duration of vibration shall be limited to that necessary for satisfactory consolidation, without causing objectionable segregation. The vibrator shall not be inserted into lower layers which have begun to set.

(2) Thin Sections: All thin section work shall be thoroughly worked with a steel rod, faces shall be shaped and mortar flushed to the surface of the forms thereby. Small diameter holes shall be drilled in form work beneath large wall sleeves and inserts which have been set therein, to prevent the entrapment of air beneath such wall sleeves and inserts, when concrete is placed.

(f) Continuous Placement: The placement of concrete within any unit of the work, between construction joints, once begun shall continue without interruption so that the unit will be monolithic in construction.

(g) Defective Work: Concrete shall be placed and compacted so as to form a dense, compact, impervious, artificial stone, with smooth faces on exposed surfaces. Any section of concrete work found to be porous, plastered, or otherwise defective, in the opinion of the Engineer, shall be removed and replaced in whole or in part, as directed by the Engineer, at the expense of the Contractor.

4.12 Construction Joints: The unit of operation between construction joints shall be as shown on the drawings or as directed by the Engineer. Concrete shall be placed continuously within the unit, as specified in the paragraph above, so that the unit will be monolithic in construction. At least 72 hours shall elapse between casting of adjoining units, unless otherwise approved by the Engineer.

(a) Joints in Footings and Walls: Construction joints in footings and walls, required for proper execution of the work, and not shown on the drawings, shall be located, as directed by the Engineer, across regions of low shearing stress so as to least impair the strength and appearance of the work. Special provisions shall be made for joining successive units, as shown on the drawings and as directed by the Engineer.

(b) Joints in Slabs: Construction joints in slabs, required for proper execution of the work, and not shown on the drawings shall be located as directed by the Engineer. Special provisions, including concrete footing for construction joints in slabs on earth, shall be made for joining successive units, as indicated on the drawings and as may be directed by the Engineer.

(c) Expansion Joints: Expansion joints, when required shall be located as indicated on the drawings and constructed in accordance with details thereon.

(d) Keys and Steel Plates: Keys shall be constructed in all construction joints, as indicated on the drawings, and as directed by the Engineer. In addition to keys, steel plates where indicated on the drawings shall be constructed in construction joints subject to water pressure. Steel plates used in such joints, unless otherwise indicated on the drawings, shall be 8-inch by 1/8 inch and of the length of the joint.

4.13 Bonding Concrete Work: Bonding new concrete work, to be placed on or against new concrete work, shall be in accordance with the following:

(a) Bonding to New Concrete: Before placing new concrete work on or against new concrete work which has recently set, the surfaces of such work shall be thoroughly roughened and cleaned of all foreign matter and laitance, forms placed or tightened and the surfaces slushed with grout. New concrete shall be placed before grout has attained its initial set. All such work shall be done in such a manner to insure complete bonding.

(1) Grout: Grout for bonding to new concrete work shall be composed of 1 part Portland cement to 3 parts sand, and from 2 to 4 inches of such grout shall be applied for horizontal construction joints.

4.14 Form Work: Form work shall be constructed and braced and shall be removed in accordance with the following:

(a) Chamfer Strips: Chamfer strips shall be placed in form for all exterior corners.

(b) Constructing and Bracing Forms: Form work shall be built to conform to shape, lines, and dimensions of the concrete work as shown or indicated on the drawings. Forms shall be set to line and grade, and shall be braced, tied and secured so as to withstand placing of the concrete, and

to maintain shape and position. Forms shall be tight and substantially assembled to prevent bulging, and to prevent leakage of concrete. Joints in form work shall be arranged vertically or horizontally. Temporary openings shall be arranged, where required, at the bottoms of wall forms and other necessary locations, to facilitate cleaning and inspection. Lumber used once in forms shall have nails removed and surfaces in contact with concrete work thoroughly cleaned before re-use. All wall sleeves, inserts, and openings required in concrete work shall be properly set in form work.

(1) Shores: Shores shall be used as necessary. If adequate foundations for shores cannot be obtained, trussed supports shall be provided. Structural members and other work, subjected to additional loads during construction shall be adequately shored to protect such work from distortion and/or damage.

(c) Removal of Forms: Forms shall not be removed, until the member supported thereby has acquired sufficient strength to safely support its own weight and the load imposed on it. Tie rod clamps that are to be entirely removed from walls shall be loosened 24 hours after concrete has been placed. Standard snap ties shall be removed when forms are stripped, with care being taken to avoid spoiling concrete surface. Cutting ties back from the face of the wall will not be permitted. Under normal conditions the minimum time elapsing before the forms may be stripped shall be governed by the following schedule; however, the use of said schedule shall not relieve the Contractor of his responsibility for the safety of the structure.

Slabs	14 days
Columns and Pedestals	7 days
Walls and Vertical Faces not supporting other work	2 days

Wood forms shall be completely removed from all portions of the work so that no material will remain for termite infestation.

4.15 Finished Concrete: All exterior concrete surfaces shall be finished to levels not less than 12 inches below finish grade levels and all interior concrete surfaces within buildings, and other such surfaces exposed to view shall be finished.

Interior clarifiers shall be finished to a level not less than 12 inches below overflow level. Concrete not exposed to view and therefore not specified to be finished shall have rough edges tooled off and shall be pointed and spot finished to fill irregularities.

(a) Pointing: When concrete has set sufficiently to permit, forms and form ties shall be carefully removed. All depressions resulting from removal of form ties, and all other holes and rough places shall be thoroughly wetted with water and pointed with non-shrink sand-cement mortar.

(b) Rubbing: After pointed surfaces have set sufficiently to permit, all surfaces specified to be finished shall be kept wetted with water, and rubbed with a carborundum stone of medium fineness, or other equally as good abrasive, to bring the surface to a smooth texture and to remove all form and other marks. The paste formed by the rubbing may be rubbed

down by floating with a canvas, a carpet-faced, or a cork float, or may be rubbed down with dry burlap. No plastering will be permitted.

4.16 Concrete Floor Surfaces and Slabs: Before constructing concrete slabs on earth, all piping under such slabs shall have received the required tests. The sub-grade shall provide a solid bearing, and shall be brought to a true and even plane. Where drains occur, floors shall be pitched thereto, as indicated on the drawings. The concrete to be placed shall be of a comparatively dry consistency and shall be screeded level or to the proper grade. After compacting or vibrating, the surface shall be prepared to receive the type of finish specified.

(a) Wood Float Finish: All walks, platforms, stairs, and exterior floor or slabwork shall have a wood float finish. After screeding to the required grade while the concrete is still green, but has hardened sufficiently to bear the finisher's weight, the surface shall be floated with a wood float to a true and even plane, with no coarse aggregate visible and sufficiently rough to prevent slipping. Interior floors to have a steel trowel finish with floor hardener.

(b) Floor Hardener: A floor hardening material to provide a working surface shall be applied to all interior concrete floors. The floor hardening material shall be Masterplate neutral color and as manufactured by Master Builders Company applied in strict accordance with the manufacturer's recommendations.

4.17 Curing and Protection: Concrete freshly placed shall be protected from wash by rain and flowing water. Concrete shall not be allowed to dry out from the time it is placed until the expiration of the specified curing period. Methods of curing, unless otherwise approved by the Engineer, shall be as follows:

(a) Wetting Concrete: Concrete shall be kept wet with clean water for a period of 7 days after placing. Each day forms are left in place will suffice for wetting.

(b) Leaving Forms in Place: Curing may be accomplished by leaving forms in place for a period of 7 days, and keeping such forms sufficiently wet to prevent opening of joints.

(c) Membrane Curing: In lieu of curing methods specified the Contractor, at his option, may use an approved membrane curing compound to seal water in concrete, except for surfaces which are to receive future concrete or mortar. The membrane shall be of non-staining type which will retain 97% of the moisture within concrete at a temperature of 135° F., with a relative humidity of 30% in the first 24 hours. Curing compound shall be applied in accordance with the manufacturer's directions.

4.18 Watertightness: Concrete required to be watertight shall be proportioned, mixed and placed in strict accordance with these specifications. All concrete structures for holding or carrying water, or pits below ground level, shall be watertight, and a loss of more than 1/4 inch depth in 24 hours will not be permitted when water holding structures are filled. All exposed surfaces of water holding structures, and interiors of pits below ground water level, shall be free from visible damp spots or seepages before acceptance.

4.19 Imperfect or Damaged Work: Imperfect or damaged work, or any work

damaged before final acceptance shall be satisfactorily removed and replaced in accordance with the requirements of the drawings and specifications. Removal and replacement of concrete work shall be done in such a manner that the strength of the structure will not be impaired.

4.20 Cleaning: Upon completion of work, all forms, equipment, protective covering and rubbish resulting therefrom shall be removed from the premises. Finished concrete surfaces shall be left in a condition satisfactory to the Engineer.

4.21 Payment: No separate payment will be made for work under this section of the specifications except as set forth in the Proposal.

DIVISION ONE and TWO

SECTION NO. 5

REINFORCING STEEL, STRUCTURAL STEEL AND MISCELLANEOUS METAL

5.01 Scope: The work covered by this section of specifications consists of furnishing all materials and equipment and performing all labor necessary for furnishing and installing all reinforcing steel, structural steel and appurtenances as indicated on the drawings, as specified; and as required for completion of all work under this contract.

5.02 Drawings: The Contractor shall furnish to the Engineer for checking and approval six copies of bending and placing details for steel bar reinforcing which shall show bar size, spacing, bending and tagging identification, and five copies of drawings covering structural steel work showing details of fabrication and erection of structural steel for checking and approval. No manufacture or fabrication shall commence until such drawings have been approved.

5.03 Reinforcing Steel: Bar reinforcement, wire mesh, and expanded metal reinforcement shall be furnished by domestic steel mills and placed in accordance with the following:

(a) Bar Reinforcement: Materials, fabrication, and placement of steel bar reinforcement shall be in accordance with the following:

(1) Materials: Steel bar reinforcement shall conform to the requirements of A.S.T.M. Standard Specifications for "Billet Steel Concrete Reinforcement," Designation A-15-54T, as amended to date, or for "Rail Steel concrete Reinforcement," Designation A-16-54T, as amended to date, subject to the following restrictions:

Billet Steel: Billet steel shall be of intermediate grade steel made by the open hearth process.

Rail Steel: Rail steel bars shall be rolled from standard tee section rails.

Cold Twisted Bars: The use of cold twisted bars will not be permitted.

Test Specimens: Test specimens shall be a minimum of 48 inches.

Deformed Bars: Steel bar reinforcement shall be of an approved deformed type, such that a mechanical bond will be provided between concrete and steel at frequent intervals. Deformation shall be in accordance with A.S.T.M. Specification A305-50T.

(2) Fabrication: Steel bar reinforcement shall be cold bent to shapes indicated on the drawings. Bending shall be done in the shop before shipment unless otherwise specified. Bending details for steel bar reinforcement shall conform to the requirements of the ACI Building Code (ACI318-56) unless otherwise indicated on the drawings or specified. Steel bar reinforcement shall be bent, bundled, and tagged in accordance with details furnished by the fabricator.

a. Splices: Steel bar reinforcement shall be furnished full length unless otherwise indicated on the drawings or approved by the Engineer. Splices, where permitted, shall be well distributed or located at points of low tensile stress. Splices and dowels, except when used in cantilever wall or slab construction shall lap not less than 30 times the diameter of the bar. Splices and dowels used in cantilever wall or slab construction shall lap 40 diameters. Splices in horizontal reinforcement shall be staggered. The minimum clear distance between spliced bars, except when bar clamps are specified, shall be 1-1/2 bar diameters, but in no case less than 1 inch, nor less than 1-1/2 times the maximum size of coarse aggregate.

b. Hooks: Hooks of 180° shall have a radius of bend on the axis of the bar of not less than three bar diameters plus an extension of four bar diameters at the free end. Hooks of 90° shall have a radius of bend on the axis of the bar of not less than four bar diameters plus an extension of twelve bar diameters at the free end.

c. Openings: Openings 12 inches and larger through concrete walls and slabs shall have a minimum of 4 extra diagonal bars in each face of the wall or slab of the same size as the largest bar in the wall or slab. The length of extra diagonal bars at openings shall be a minimum of 80 bar diameters.

d. Minimum Reinforcing: Concrete walls, slabs and other concrete work shown on the drawings to have no reinforcing, shall have a minimum area of steel bar reinforcing equal to 0.003 times the cross sectional area of the concrete work.

(3) Placing: Steel bar reinforcement shall be placed in the locations shown on the drawings and held securely in place during the placing of concrete. The pushing of short bars into new concrete work will not be permitted. Bar reinforcing in walls shall be spaced the proper distance from the face of the wall by the use of approved pre-cast concrete mortar blocks. Bar reinforcing in slabs or beams shall be spaced the proper distance from the bottom of the slab or beams by use of approved pre-cast concrete mortar blocks or steel chairs. Vertical stirrups shall always pass around main tension members and be securely attached thereto. Bar spacing, covering, minimum clearance, bond and anchorage shall conform to the requirements of the ACI Building Code (ACI318-56), as amended to date, except as otherwise indicated on the drawings or specified.

(4) Fastening, Reinforcing and Placing Concrete: Steel bar reinforcing, when properly placed, shall be securely wired together at intersections with 18 gauge black annealed wire. Prior to the placing of concrete all mortar and other foreign matter which may reduce or destroy bond shall be removed from the reinforcement. No concrete shall be deposited until the placement of the reinforcing has been approved by the Engineer.

(b) Wire Mesh Reinforcement: Wire mesh reinforcement, when shown on the drawings or specified to be required in the work to be done, shall be furnished and placed in accordance with the following:

(1) Materials: Wire mesh reinforcement shall conform to the requirements of A.S.T.M. Standard Specification A-185-54T, as amended to

date, and unless otherwise indicated on the drawings, shall be 4-inch by 4-inch mesh, of 6 gauge wire.

(2) Placement: Wire mesh reinforcement shall be secured in position by spacer bars and chairs. Spacer bars shall be lapped not less than 5 inches. Pre-cast concrete mortar blocks may be used in lieu of metal chairs in slabs on ground. Mesh shall be checked for position during placing of concrete and any displacement corrected. Mesh shall overlap 1 inch at edges unless otherwise indicated on the drawings, and shall be securely tied at ends and overlap.

(c) Expanded Metal Reinforcement: Expanded metal reinforcement, when shown on the drawings or specified to be required in the work to be done, shall be of a type approved by the Engineer, of metal equal in quality to that specified for bar reinforcement; and when placed shall overlap each other sufficiently to maintain a uniform strength and shall be securely fastened at the ends and additions.

(d) Reinforcement - Storage and Protection: Steel reinforcement shall be stored above the surface of the ground upon platforms, skids or other supports, and shall be protected as far as is practicable from mechanical injury and surface deterioration. When placed in the work it shall be free from rust, dirt, scale, paint, oil or other foreign matter which may reduce or destroy bond.

5.04 Steel and Iron: All steel and iron including structural steel ingot iron and wrought iron and other miscellaneous iron and steel work shall be furnished, fabricated and erected in place as necessary for the complete construction of all work shown on the drawings and/or specified.

(a) Structural Steel: Structural steel shall be furnished in accordance with the requirements of A.S.T.M. Standard Specifications "Structural Steel for Buildings," as amended to date. Fabrication and erection shall be in accordance with A.I.S.C. requirements. Painting shall be in accordance with the section "Painting" of these specifications.

(b) Steel Joists: Steel joists where indicated on the drawings to be required for construction of the work shall be furnished and erected as indicated on the drawings and in accordance with the standard specifications of the Steel Joists Institute. Shop and field painting of steel joists exposed to view shall be as specified for structural steel.

(c) Wrought Iron shall be reinforced bar iron, tough, fibrous, and uniform in character. It shall be thoroughly welded in rolling and be free from surface defects and shall conform to "Specifications for Refined Wrought Iron Bars," Federal Specification QQ-I-686a.

(d) Bolts and Nuts shall be of the best quality mild steel, or wrought iron, except where bronze nuts are shown on the drawings. They shall have hexagon nuts, but may have square heads. Heads and nuts shall have the under-surfaces true and at right angles to the axis of the bolts. Bolts shall have sound, well fitting, truncated "V" threads, American National coarse-thread standard. When bolts are used in place of rivets, they shall have a driving fit. Bolts and nuts in general shall be of United States Standard dimensions. All anchor bolts embedded in concrete shall be of galvanized mild steel or wrought iron.

(e) Expansion Bolts: Anchor bolts and screws, in general, shall be placed in forms prior to pouring concrete. When expansion bolts must be used they shall be Ackerman-Johnson, National, or approved equal.

(f) Workmanship shall be first class in every respect and shall conform to the lastest and best practice as set forth in the latest specifications of the American Institute of Steel Construction. All material shall be thoroughly straightened in the shop by methods that will not injure it before templates are placed on same for laying off and before any work is done upon it. All material shall be kept clean and protected from the weather.

(g) Welding, in general, shall be used for connections in fabricated miscellaneous metal work. All welding shall be performed in accordance with Code I, Part A, of the "Code for Fusion Welding and Gas Cutting in Building Construction", as revised to date by the Committee in Building Codes of the American Welding Society. In assembling and during welding, the component parts of built-up members shall be supported and held by sufficient clamps and other adequate means to hold the parts in proper relation for welding.

(h) Drawings: Where details are shown on the drawings, the structural steel or wrought iron work shall conform accurately to them. Where the drawings are diagrammatic, the Contractor shall design the connections in accordance with the best shop practice and so as to develop the full strength of the members. The Contractor shall furnish for approval, complete shop drawings showing all framed work and all connections to concrete or other masonry, and shall also furnish all necessary erection drawings.

(i) Shop Painting: Except as otherwise specified, exposed surfaces of steel and iron (except galvanized surfaces) shall be painted in the shop after fabrication as specified under "Painting." Contact for riveting or welding in the field shall be left bare and painted promptly after the field welding or riveting is completed. Steel work for floating covers and certain other equipment shall not be shop painted, but shall be cleaned by sandblasting and painted on the job as specified under "Painting".

5.05 Iron Castings: The Contractor shall furnish and install all miscellaneous iron castings, including catch basin and manhole frames, covers, steps, floor drains, bolt inserts, brackets, supports and such other iron castings as are shown on the plans.

(a) Castings, unless otherwise specified shall be of gray-iron conforming to Federal Specifications QQ-T-652.

(b) Malleable Castings shall conform to Federal Specifications QQ-I-666.

(c) All castings shall be tough, close-grained, and smooth, and free from blow holes, blisters, shrinkage stains, cracks, cold shots, and like defects. No plugging of defective castings will be permitted.

(d) Workmanship: All castings shall be made accurately to dimensions shown on the plans or ordered and shall be planed or ground where necessary whether marked or not, to secure perfectly flat bearing surfaces. Allowance shall be made in the patterns so that the specified thickness

of metal will not be reduced.

(e) Weights: No castings will be accepted, the weight of which is less than the theoretical weight, based on required dimensions, by more than five (5%) per cent.

(f) Cleaning and Painting: All castings shall be thoroughly cleaned and painted before rusting begins. All castings except those to be embedded in concrete, shall be cleaned and given a priming coat of paint in the shop. Castings which will be exposed in buildings shall receive a shop coat of zinc chromate and iron oxide. Castings which are to be installed outdoors, such as manhole frames, covers and steps, shall be given 2 costs of approved bituminous paint in the shop.

5.06 Aluminum: Aluminum work shall be furnished as indicated on the drawings and as specified below.

(a) Subway Grating: All subway grating shall be fabriated from aluminum, and shall be of the size and type shown on the drawings. Aluminum bearing angles shall be anchored in concrete to form grating frames. Cuts in grating around piping and other openings, as well as ends of bearing bars shall be banded. Grating layout shall be made from approved piping and valve layout drawings. Suitable anchors shall be provided for all grating supported on structural steel members, and in other locations where shown on the drawings.

(b) Aluminum Gates and frames shall be built of structural or extruded shapes as shown on the plans, or specified and shall be given an anodizing finish equal to Alcoa No. 205 Aluminite.

5.07 Payment: No separate payment will be made for work under this section of the specifications, except as set forth in the Proposal.

DIVISION ONE

SECTION NO. 6

SEWERS AND APPURTENANCES

6.01 Scope: Work under this section of specification consists of furnishing all materials and equipment and performing all labor necessary for the installation of clay and/or concrete sewer lines with appurtenances, complete to limits shown on the drawings and as specified.

6.02 Excavation: The top portion of sewer pipe trenches may be excavated with sloping or vertical sides to any width which will not cause damage to adjoining structures, roadways, pavements, utilities or private property. The width of the lower portion of the trench to a height of two feet above the top of the pipe shall not exceed the width shown in the tabulation, under the Paragraph "Bedding and Backfilling" of this section of specifications. If trenches are excavated to widths in excess of these limitations or collapse because of unsuitable or insufficient bracing and sheeting, the Contractor will be required to use special methods of contructing pipe foundations and of backfilling as specified herein at no additional expense to the Owner. No extra payment will be made for rock excavation in trenches.

(a) Bell Holes: Bell holes shall be excavated so as to relieve pipe bells of all loads, but small enough to insure that support is provided throughout the length of the pipe barrel.

6.03 Bracing and Sheeting: The sides of all trenches and excavation for structures shall be securely held by stay bracing, or by skeleton or solid sheeting and bracing, as required by the soil conditions encountered, unless otherwise permitted by the Engineer.

(a) Removal of Bracing and Sheeting: Bracing and sheeting may be removed in units when the level of backfilling has reached the elevation necessary to protect the pipe work and to protect adjacent property. Sheeting near the bottom of trenches which are over ten feet deep for sewers of 15" size and larger shall remain in place and shall be cut off not less than two feet above the top of the completed sewer. When, in the opinion of the Engineer, sheeting or shoring above this level cannot be safely removed, it shall be left in place. Timber so ordered to be left in place shall be cut off at least two feet below the surface.

6.04 Bedding and Backfilling: All trenches and excavation shall be backfilled immediately after the sewers are laid therein. Backfilling shall be compacted in not more than six inch layers with heavy rammers or air tamps to a depth of two feet above the top of the pipe. Walking or working on the completed sewer pipe, except as may be necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a height of at least two feet over the top of the pipe. Special methods of shaping the pipe foundation, bedding and tamping will be required for eight to twelve inch sewers in cuts exceeding six feet and for all sewers 15" and larger in all depths of cut.

The cost of special bedding and tamping shall be included in the price bid for sewers, except that the Engineer may authorize payment for concrete or crushed stone bedding where poor soil conditions are encountered or excessive

line loads are anticipated. Payment will be made in accordance with unit prices bid.

A. Special Concrete Bedding: Special concrete bedding shall consist of Class "C" concrete. In the use of the special concrete bedding, the trench shall be excavated to a depth of 1/4 the nominal diameter of the pipe below pipe grade and the pipe laid to line and grade on concrete blocking. Concrete shall then be poured to the full width of the trench to a height of 1/4 the nominal diameter of the pipe above the invert.

A-1 Extra Strength Sewer Pipe: Extra strength sewer pipe may be used for sewers 30-inch and smaller, using bedding method B in lieu of A.

B. Special Earth Bedding: Special earth bedding shall be performed by first shaping the bottom of the trench to a level slightly lower than the bottom of the pipe. The pipe bed shall then be brought to the proper level by spreading and thoroughly tamping a layer of fine granulated, moist earth and sand so as to conform accurately to one-fourth the circumference of the pipe barrel. If suitable granulated materials are not available from trench excavation, the Contractor will be required to obtain them elsewhere. After laying the pipe, sheeting and bracing shall be withdrawn or cut off as specified, the trench shall then be backfilled and hand tamped with thin layers of the same selected material to a height of three-fourths the diameter of the pipe. The balance of the trench shall then be backfilled as specified previously. Trenches excavated to excess depths shall be brought to proper grade by bedding with stone or gravel at the Contractor's expense. First class workmanship and careful inspection to avoid disturbing pipe grade, alignment and joints must be exercised at all times.

C. Shaped Bottom Trenches: Trenches for which a shaped bottom is required shall be trimmed by hand to conform to the lower part of the pipe barrel for at least one-fourth its circumference. If this shaping cannot be performed accurately, special bedding will be required. Tamping shall be done as specified under paragraph "B".

D. Flat Bottom Trenches: Flat bottom trenches will not be permitted anywhere for sewers 15-inch and larger at any depth of cut. Sewers up to 12-inch size may be laid in flat bottom trenches for depths of cut not in excess of 6 feet. Tamping shall be performed as specified under paragraph "B".

E. Maximum Trench Depth for Various Bedding Methods: Maximum trench depths for various bedding methods, for pipe of the strength shown, are given in the following table:

MAXIMUM TRENCH DEPTHS FOR VARIOUS BEDDING METHODS			BEDDING METHOD			
			D	C	B	A
Size Pipe	Minimum Strength 3-edge	Maximum Trench Width	Flat Bottom Trench	Shaped Bottom Trench	Special Earth Bedding	Special Concrete Bedding
8"	1300	2' - 2"	6	12	16	30
10"	1400	2' - 4"	6	11	16	30
12"	1500	2' - 6"	6	10	15	30
15"	1750	2' -10"	None	10	14	28
18"	2000	3' - 2"	"	10	14	24
21"	2200	3' - 6"	"	10	13	22
24"	2400	3' -10"	"	10	13	21
30"	3200	4' - 7"	"	10	13	21
36"	3900	5' - 5"	"	10	13	21
42"	4725	6' - 1"	"	12	15	22

F. Pipe Strength: Sewer pipe which does not conform to the preceding table as to strength, but whose test strength is not less than 90 per cent of the preceding values, may be acceptable by special permission from the Engineer. Flat bottom trenches shall not be used for any size sewer pipe with a low test strength.

G. Excess Trench Width or Trench Collapse: If trenches are excavated to widths in excess of those specified or trench walls collapse, sewers shall be laid in accordance with the requirements for at least the next better class of bedding, at the expense of the Contractor, as directed by the Engineer.

6.05 Sewer Pipe: Unless otherwise specified, 15" or smaller pipe used for sanitary sewage shall be vitrified clay. Pipe 18" and larger may be vitrified clay or concrete. Pipe used for surface drainage may be either clay or concrete. All pipe shall be tested by an approved testing laboratory and stamped as specified under the Section "Control of Materials" of these specifications. All pipe shall be first quality of smooth exterior and interior surfaces, free from cracks, flaws, blisters and other imperfections, true to their theoretical forms throughout their length. All work done and materials furnished shall be subject to the inspection of the Engineer and all improper work shall be reconstructed. All materials which do not conform to the requirements of these specifications shall be removed from the work upon notice being received of the rejection of such material.

(a) Type of Sewer Pipe: Vitrified clay pipe for sewers size 36-inch and smaller shall have bell and spigot type joints. Concrete pipe for sewers size 18-inch and larger shall have "O-ring" rubber gasket type joints. Pipe shall conform to the standard specifications for the respective types and classes designated herein except as to certain strength requirements made necessary for abnormal trench loads and as to certain requirements for concrete sewer pipe joints.

(b) Experience: The manufacturer of the sewer pipe furnished under this section of specifications shall submit evidence of having consistently produced a pipe of satisfactory quality and performance results in service over a period of at least two years.

6.06 Pipe Specifications: Except as otherwise specified, all pipe shall conform to the respective A.S.T.M. standard specifications as follows:

(a) ASTM Designation C13-54 - for standard strength clay sewer pipe, 36-inch and smaller.

(b) ASTM Designation C14-55 - for standard strength non-reinforced concrete sewer pipe sizes 15-inch and smaller.

(c) ASTM Designation C75-55 - for standard strength reinforced sewer pipe sizes 18-inch to 30-inch inclusive.

(d) ASTM Designation C76-55, Table 1 - for standard strength reinforced concrete sewer pipe 36-inch and larger.

(e) ASTM Designation C200-55T - for extra strength clay sewer pipe 36-inch and smaller.

(f) ASTM Designation C76-55, Table 1 - for extra strength reinforced concrete sewer pipe size 21-inch and smaller.

(g) ASTM Designation C76-55, Table 2 - for extra strength reinforced concrete sewer pipe size 24-inch and larger.

Standard strength sewer pipe shall be used for all sewer lines not otherwise specified. Extra strength sewer pipe may be used where permitted under the paragraph "Bedding and Backfilling" above.

6.07 "O-Ring" Rubber Gasket Type Joint Concrete Sewer Pipe Size 18-Inch and Larger: "O-Ring" rubber gasket type joints for reinforced concrete sewer pipe size 18-inches and larger shall generally conform to the applicable provisions of A.S.T.M. Designation C361-55T for low head pressure pipe. The joint assemblies shall consist either (1) of steel bell and spigot rings or (2) of all concrete bell and spigot joints or (3) of joint utilization collars in lieu of bells for spigot end pipe, each with circular rubber ring gaskets as the sole element utilized in sealing the joint. A rectangular groove shall be provided in the spigot end to receive the rubber gasket and the joint assemblies shall be so formed and accurately manufactured as to provide a close lining fit with the rubber gasket confined on all four sides. All exposed surfaces of steel bell and spigot rings shall be protected by a coating of zinc applied by an approved metallizing process. Joint utilization collars under (3) above shall be accurately formed with sleeves consisting of catalyzed and heat reacted Epoxy resin reinforced with high tensile strength fiberglass wrapping and fabric, similar and the approved equal in formulation and manufacture to "Amband" glass-resin coupling made by the American-Marietta Company, Chicago, Illinois. Wall thickness, steel reinforcement and minimum strength of the pipe barrel shall conform to provisions heretofore for reinforced sewer pipe.

6.08 Laying Sewer Pipe: All sewer pipe shall be laid upgrade with the spigots pointing downgrade. The pipe and specials shall be so laid in the trench that after the sewer is completed the interior surface shall conform on the bottom accurately to the grades and alignment fixed or given by the Engineer.

(a) Laying Sewer Pipe with Bell and Spigot Type Joints: Jointing Compound: Sewer pipe and connections with bell and spigot type joints shall be laid with plastic joints except as otherwise specified for pipe

to be laid in wet trenches or under wet conditions. Plastic jointing compound shall be a filled hydrocarbon plastic, shall adhere firmly to the surface of the pipes, shall melt and run freely at a temperature of 430 degrees F., and when set shall be sufficiently elastic to permit a slight movement of the pipes without injury to the joints or breaking the adhesion of the compound to the pipe. The compound shall not deteriorate when submerged in fresh or salt water or normal domestic sewage and shall show no deterioration of any kind when submerged for a period of sixty (60) days in a five (5) per cent solution of each of the following compounds: H_2SO_4, NaOH, KOH, and NaOCL. The plastic compound shall be JC-60 compound as manufactured by the Atlas Mineral Products Company of Mertztown, Pennsylvania, or approved equal. Priming solution shall be used for all types of sewer pipe and shall be applied to both the exterior surface of the spigot and the inside of the bell at least one day before the pipe is laid. Priming solution shall be Atlas No. 60 primer, or approved equal. The heated compound shall flow freely like water but shall not be heated to a point of becoming frothy or turbulent. The printed instructions of the manufacturer shall be obtained, kept on the job for ready reference and all provisions strictly followed. In general bell and spigot type sewer pipe with plastic joints shall be laid in accordance with the following:

(1) Gasket: A gasket of dry jute shall be properly caulked into each joint and the joint filled with hot poured plastic joint compound. Hard gaskets must not be used. The methods employed in pouring compounds shall be exactly in accordance with the manufacturer's instructions.

(2) Wet Condition: Plastic joints shall not be poured where water or moisture is present. The pipe shall be kept clean and dry.

(3) Prime Coat: No plastic joints shall be poured where the pipe or prime coat has been soiled by earth in handling until such soiled surfaces are so throughly cleaned by wire brushing and wiping that all traces of the earth are removed.

(4) Pouring Joints: No joints shall be poured until the next succeeding joint shall have been gasketed and caulked. All joint material that may be left on the inside shall be thoroughly cleaned out and the pipe left clean and smooth throughout. Every third pipe shall be filled around immediately after being properly placed and caulked to prevent the moving of joints.

(b) Laying Bell and Spigot Sewer Pipe Under Wet Conditions: "Diaper" Joint: Whenever wet ditches are encountered or where pipe joints cannot be kept dry until poured, one cement "diaper" joint and one plastic joint shall be used alternately, or, at the option of the Contractor, all joints in wet ditches shall be made as follows: After caulking with jute or oakum, the joint shall first be encircled with a heavy, two-ply muslin envelope or "diaper", stitched along each edge and provided with tie wires of bailing wire. Through an opening in the envelope at the top, or at the sides for large pipe, the joint shall then be completely filled with Portland cement mortar, made of equal parts of cement and sand as specified for concrete, mixed dry, then mixed with water in which an approved waterproofing compound has first been dissolved so as to provide seven pounds of waterproofing compound per cubic yard of mortar. The

compound shall be a metallic soap type, having ammonia as a dispersing agent, as manufactured by Truscon Laboratories, Master Builders, or approved equal. The mortar shall flow freely into and entirely fill the joint space, and shall be pressed firmly into the joint with the hands after excess water has drained out. After the joints have hardened the tops shall be pointed up with cement mortar mixed the same as above but only wet enough for workability.

(c) Laying Concrete Sewer Pipe with Rubber Gasket Type Joints: The surfaces of pipe to be joined as well as the rubber gaskets shall be clean and lubricated with a vegetable soap to permit uniform placement in accordance with the manufacturer's written instructions. After each joint is installed, the gaskets shall be checked for proper position in the groove prior to installation of the next succeeding length of pipe. The external and internal recesses at each joint shall be filled with cement mortar wherever such construction is recommended by the manufacturer.

(1) Temporary Blocking: Any temporary blocking used to facilitate installation of the pipe shall be removed and selected material shall be tamped in the void left by such blocking.

(2) Cleaning Pipe Interior: The interior of the pipe shall be carefully freed of all dirt and superfluous material of every description, as the work proceeds.

(3) Defective Joints: Defective joints discovered after laying shall be repaired and made tight. Defective pipe shall be removed and proper replacement made.

6.09 Leakage: The allowable limit of the leakage of ground water into sewers shall not exceed the following rates of infiltration:

(a) 0.25 gallons per inch diameter per foot of pipe per day for any stretch of sewer between adjoining manholes.

(b) 0.15 gallons per inch diameter per foot of pipe per day for any sewer, or system of sewers, one mile orless in length.

(c) 0.10 gallons per inch diameter per foot of pipe per day for any trunk sewer, or sewer system, the total length of which is greater than one mile.

(d) Leakage Tests: Leakage tests shall be made only when the ground water table is above the top of the sewer pipe and after all visible leaks have been stopped. In case the leakage exceeds the rates above specified, the sewer will not be accepted until so repaired that it will comply with these requirements.

6.10 Testing and Cleaning: Before acceptance of the sewer system, it shall be tested and cleaned to the satisfaction of the Engineer. Where any obstruction is met, the Contractor will be required to clean the sewers by means of rods or swabs or other instruments. The pipe line shall be straight and show a uniform grade between the manholes.

6.11 Manholes: The bottom of manholes shall be built of Class B concrete and the walls shall be built of whole hard burned brick of good quality laid in

cement mortar made of one part cement and two parts sand. Cement shall be 75% Portland and 25% Puzzolan. Immediately before laying, the brick shall be thoroughly saturated with water. Every brick shall be carefully imbedded in mortar on its bottom and sides and the walls shall be thoroughly plastered on the outside with a smooth coat of 1:2 cement mortar. Mortar materials shall be as specified for concrete. Manhole frames, covers, and steps shall be as shown on the drawings.

6.12 Connections to Existing Manholes: Where shown on the drawings, new sewers are to be connected to existing manholes. This work consists of making the opening in the brick wall, inserting the new sewer at the elevation shown, filling the space around the wall with mortar and brick and any necessary remodeling of the manhole bottom. The Contractor shall temporarily block and/or divert the sewage flows in the existing sewers while forming proper channels in the connecting manholes.

6.13 Dewatering Trenches: All excavation shall be dewatered properly before laying pipe. Where running sand is encountered, dewatering shall be done by well pointing whenever possible. Where soil conditions are not favorable for use of well point, french drains of crushed stone or gravel shall be constructed to suitably located sumps and the water removed by bailing or pumping. No extra payment will be made for crushed stone or gravel which has been used in lieu of well points.

6.14 Crushed Stone Fill: Whenever the sub-grade is too soft or mucky, in the opinion of the Engineer, for the proper installtion of the sewer, he may order the Contractor to undercut the ditch and backfill with crushed stone 3/4 inches in size or less. The stone so placed shall be brought to grade and compacted. The stone shall be paid for in accordance with unit price bid and shall include the cost of undercutting and compacting. In the event rock excavation is encountered at grade in trenches, the trench shall be excavated 6 inches below grade and refilled to grade with clean stone dust, crushed stone or other approved material, thoroughly tamped in place and shaped to conform to pipe as heretofore specified. No extra payment will be made for these backfill materials.

6.15 Steel Sheeting: Corrugated steel sheeting where called for on the plans shall be new, continuous, interlocking type fabricated from eight (8) gauge open hearth steel and fully galvanized. The interlock shall be continuous and shall be formed in such a manner so that adjoining sections shall not become disengaged during driving. The sheeting shall be straight and uniform in section and shall be formed with corrugations not more than six (6") inches from crest and not less than two (2") inches deep.

Cast steel driving heads shall be used for driving steel sheeting and shall have a recess conforming to the cross-section of the sheeting. The driving equipment must be capable of applying ample foot-pounds of energy to drive the piling easily and must have low velocity of impact so as not to damage the top of the sheeting. Sections damaged in driving shall be removed and replaced with new sections at the Contractor's expense. Top of sheeting shall either be driven to, or shall be cut off to, a neat line and to elevations as shown on the plans.

Corrugated steel sheeting will not be measured for payment as a separate item, but shall be included in the price bid for the work of which it is a part.

6.16 Diverting Sewage to Treatment Plant: The Contractor shall connect to sewers which are built under Division No. 2, and he shall divert the sewage flow from the temporary diversion lines to the Trunk and Interceptor Sewers when the Treatment Plant is ready for operation. In addition, he shall plug the temporary diversion lines as shown on plans. No extra payment will be made for this work.

6.17 Payment: No separate payment will be made for work under this section of Specifications except as specified. The cost of all such work and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.

DIVISIONS ONE and TWO

SECTION NO. 7

METAL PIPE, FITTINGS, VALVES, GATES AND HYDRANTS

7.01 Scope: The work covered by this section of Specifications consists of furnishing all materials and equipment and performing all labor necessary to install all interior and exterior metal piping systems and valves, complete, as shown on the drawings or specified, and as required for proper operation of all equipment installed under this contract.

7.02 Drawings: The Contractor shall furnish five copies of pipe fabrication details and dimensional layouts for all piping systems for checking and approval by the Engineer. Each joint of pipe and fittings shall be marked and dimensioned to insure proper installation. No fabrication, manufacture, or installation shall commence until such drawings have been approved.

7.03 Cast Iron Pipe, Ductile Iron Pipe and Fittings: Cast iron pipe and fittings shall be in accordance with the following:

(a) Cast Iron Pipe: Cast iron pipe 4-inch and larger shall conform to Federal Specifications WW-P-421a, with bell and spigot leaded joint or with manufacturer's standardized mechanical joint or flanged, as indicated on the drawings. All cast iron pipe shall be centrifugally cast and shall be furnished in standard lengths. Mechanical joint pipe and flanged pipe shall be used where called for on the drawings. Other cast iron pipe may be either mechanical joint or bell and spigot with caulked and leaded joint.

Cast iron pipe 12-inches in diameter and smaller shall be Class 150. Cast iron pipe larger than 12-inches may be Class 100 unless otherwise shown on the drawings or specified. 24" C.I. force main outside of structures, installed in earth, shall have A.S.A. Class No. 25, wall thickness of 0.85". Flanged pipe shall be WW-P-421a Class 150 with 125# A.S.A. flanges.

Cast Iron bell and spigot pipe for sizes 3-inch and smaller shall conform to Federal Specification WW-P-421a as to general requirements, material, workmanship and tests. Wall thickness shall be suitable for 250 pounds working pressure, but not less than the following:

Nominal Diameter, Inches	Wall Thickness, Inches
2 or 2-1/4	.25
3	.30

Pipe 3" and smaller, shall be cast in nominal laying lengths of 5 to 6 feet, shall be factory assembled and shipped in multiples thereof, but not longer than 20 feet. Intermediate joints for factory assembly shall be A.S.A. taper pipe threads, made one pipe size larger than the nominal pipe diameter. Joints for field installation shall be virgin lead, factory prepared and provided with protectors for shipment and handling, or standard mechanical joints. A suitable hexagon or octagon shall be cast on the external surface of all pipes near each thread for wrench use.

Each cast length shall have a tapping collar cast on the pipe for making taps 1-inch size and smaller. Larger connections shall be made with tapping sleeves.

(b) Cast Iron Fittings and Specials: Cast iron specials 12" and under shall be Class D; over 12" including 24" shall be Class B, and over 24" shall be Class A. Flanged fitting shall be A.S.A. Class 125. Bell and spigot specials shall conform to the requirements of the American Water Works Association unless otherwise shown on the drawings. American Gas Association specials may be used for air and gas lines.

(c) Ductile Iron Pipe: Ductile Iron Pipe shall be used for river crossings on piers where indicated on the plans. This pipe shall conform to applicable requirements of Federal Specifications WW-P-421a, 60-45-10 grade ductile iron, Class 23, mechanical joint.

(d) Lining: All cast iron pipe,ductile iron pipe, and fittings for water, sewage and sludge lines shall be furnished with a standard cement lining approximately 1/16 inch in thickness and shall be coated inside and out with an approved coal-tar coating. Pipe and fittings for gas lines shall be uncoated inside, bituminous coated outside.

(e) Weight: No pipe will be accepted, the weight of which is less than the standard weight by more than five (5%) per cent for pipe 16 inches or less in diameter and four (4%) per cent for pipe more than 16 inches in diameter. The American Water Works specifications regarding minimum and maximum weights for specials shall apply.

(f) Flanges: Flanges for cast iron pipe and fittings shall be faced and drilled Class 125 American Standard.

(g) Marking: The class designations for the various classes of pipe and fittings shall be cast onto fittings in raised letters or numerals and painted on the outside of each joint of pipe. Weights shall be plainly and conspicuously painted in white on the outside of each fitting and each joint of pipe after the bituminous coating has hardened.

(h) Substitution for Wrought Iron: Small diameter Cast Iron Pipe and fittings may be used wherever genuine wrought iron is shown on the drawings.

7.04 General Provisions for Laying Exterior Cast Iron Pipe Lines: The Contractor shall lay all pipe and fittings to accurately conform to the lines and grades established by the Engineer and as follows:

(a) Handling: Proper and suitable tools and equipment, for the safe and convenient handling and laying of pipe shall be used, and great care shall be taken to prevent the pipe coating from being damaged, particularly the cement lining on the interior of the pipe. All pipe shall be carefully examined for cracks and other defects, and no pipe or other casting shall be laid which is known to be defective. If any pipe or other casting is discovered to be cracked, broken, or defective after being laid, it shall be removed and replaced with sound material without further charge. All pipe and fittings shall be thoroughly cleaned before being laid, and shall be kept clean until accepted in the complete work.

(b) Alignment and Gradient: Pipe line alignment and gradient shall be straight, or shall follow true curves as near as is practicable. Curvature in pipe lines, where required shall be well within the allowable laying radius; horizontal or vertical.

(c) Sequence of Work: Excavation, cleaning, laying, jointing, and backfilling shall be kept up as closely as is possible so as to progress the work in a uniform, workmanlike manner. In no case shall pipe be left in the trench overnight without completing the jointing. The completed pipe line shall not be left exposed in the trench unnecessarily and the Contractor will be required to backfill and compact the trench as soon as is possible after laying and jointing is completed. Each day at the close of work, and at all times when laying is not in progress the exposed end of the pipe line in the trench shall be closed by the use of an approved head or barrier of wood or metals. If at any time it becomes necessary to cover the end of an uncompleted pipe line with backfill, the end of such pipe shall be closed using a mechanical joint plug.

(d) Cleaning: The Contractor shall clean each joint of pipe while it is suspended before it is lowered into the trench.

The Contractor shall keep exposed ends of pipe properly plugged during laying to prevent dirt and other materials entering the line, and shall also, before the system is accepted, thoroughly clean all lines.

(e) Laying Pipe in Trenches: When laying pipe in trenches, care shall be taken to give the pipe solid bearing throughout its entire length, and the earth used in refilling trenches, from the bottom of the trench, under and up to two (2') feet over the top of the pipe line shall be of selected material, carefully packed, tamped and rammed with proper power tools for the purpose. Pipe in rock trenches shall be carefully bedded in clay to prevent contact with the rock. All tees and bends in pipe lines shall be firmly wedged with Class "C" concrete poured between fittings and the vertical face of the trench, all exposed pipes, valves, hydrants etc. must be securely strapped and all ends and bends properly braced. No summits will be allowed in force mains, sludge lines or supernatant lines. Pitch all gas lines to drip traps.

(f) Blocks or Wedges: Wherever required by the Engineers, suitable wood blocks or wedges shall be furnished and placed, for laying pipe.

(g) Pipe Lines Encased in Concrete: Cast iron pipe and fittings indicated on the drawing to be encased in concrete shall be encased in Class "B" concrete and shall be encased as indicated on the drawing. Such pipe and fittings for encasement in concrete shall be properly supported on pre-cast concrete saddles.

(h) Mechanical Jointing: Mechanical joints shall be made only by experienced mechanics. Sockets and spigots shall be washed with soapy water before slipping gland and gasket over spigot. The spigot shall be inserted in the socket full depth. The gasket shall be brushed with soapy water and shall be pushed into position making sure the gasket is evenly seated in the socket. The gland shall be slid into position for compressing gasket. All bolts and nuts shall be tightened "finger-tight"; after which bolts shall be tightened to a uniform permanent tightness using a torque wrench for tightening. Bolts shall be tightened

alternately 180 degrees apart. Sockets, spigots, gaskets, glands, and bolts shall be kept clean and wet with soapy water until each joint is completed. Suitable bell holes shall be cut in the bottom of the trench where the joints come in order to secre a uniform bearing of the pipe in the trench.

(i) Jointing Flanged Connections: Flanges shall have 125# American Standard drillings. Gaskets of rainbow rubber, or equal, with cloth inserts, shall be used. Flanges shall be firmly bolted with machine bolts of the proper size and thread. The bolts and nuts shall be of the best quality refined bar iron, with good, true threads, and shall be so tightened as to evenly distribute the stress in the bolts and bring the pipe into uniform alignment.

(j) Jointing Bell-Spigot Connections with Lead Joints: All bell-spigot connections shall be jointed with lead and tubular or molded rubber gasket. The inside of the bell, and the outside of the pipe shall be thoroughly cleaned. Only joint runners in good condition shall be used on the work.

(1) Gasket: All lead joints shall be made with best quality tubular or molded rubber gasket, properly installed in accordance with manufacturer's recommendations.

(2) Lead: The lead shall be of the best quality virgin lead, pure and soft and suitable for caulking. The depth of lead joint shall not be less than 2 inches and, in all cases, must be poured to the full depth of the lead groove. The melting pot shall be kept near the joint to be poured and not more than one pouring shall be made for each joint. Dross shall not be allowed to accumulate in the melting pot. The joints shall be thoroughly caulked by competent mechanics, in such a manner as to secure a tight joint without overstraining the iron in the bells.

(3) Defective Joints: All defective joints shall be melted out and replaced to the satisfaction of the Engineer.

(k) Cutting: Whenever pipe or special castings are required to be cut, the cutting shall be done by skilled workmen.

(l) Testing: When a section of pipe is ready for testing, the line shall be thoroughly blown free from air and a leakage test made for a period of one hour at a pressure of not less than 50 lb. per square inch above the working pressure. The Contractor shall furnish all labor, materials, and equipment for carrying out these tests. Joints which leak shall be carefully recaulked or cut out and repoured, and retested under the same conditions and under the same period of operation until the line passes the required test. Whenever possible, testing will be done before trench is backfilled.

7.05 Galvanized Steel, Galvanized and Black Wrought Iron Pipe: Wrought iron pipe shall be standard weight genuine galvanized iron pipe with screw joints conforming to Federal Specifications WW-P-441A. Fittings shall be galvanized, malleable iron conforming to Federal Specification WW-P-521A, except that nipples and couplings shall be of the same materials as the pipe. Specifications for trenching and laying shall conform to those given herein for cast iron pipe. Use black pipe only for gas. Standard weight galvanized steel pipe, with

malleable iron fittings, threaded I.P.S., may be used for yard piping where indicated on the drawings.

7.06 Wall Sleeves: Where cast iron piping connects with or passes through concrete walls, furnish and install cast iron wall sleeves suitable for caulking as speicified under cast iron pipe. Formed openings in concrete walls for inserting cast iron piping will not be allowed. Wall sleeves shall be accurately located and securely fastened in place before concrete is poured. In a similar manner, wall pipes shall be used in locations where small piping and electric wiring connects with or passes through concrete walls.

7.07 Heavy Interior Piping Systems: The Contractor shall furnish and install all heavy interior piping systems, complete, as indicated on the drawings and specified and/or as required for proper operation of equipment. Such piping systems shall be joined as specified under paragraph 7.04 above and shall be properly supported by a system of hangers, pipe stanchions, brackets, concrete piers and saddles as required. Inserts, bolts and anchors as required for proper support shall be set into form work or concrete work by the Contractor before any concrete is poured. Pressure lines shall be secured with struts or reaction blocking to prevent any slippage.

7.08 Operating Piping Systems: The Contractor shall furnish and install all small operating and control piping systems and other small piping systems indicated on the drawings and/or as required for operation of all equipment.

(a) Materials: Piping for all operating and control piping systems shall be of hard drawn copper except as otherwise specified. Copper pipe, copper fittings, and joints and valves shall be as follows:

(1) Copper Pipe: Pipe sizes specified are nominal internal diameters. All exposed pipe except as otherwise specified, shall be of hard drawn rigid copper pipe. Pipe installed in ducts or within equipment cabinets may be of soft drawn copper. All such soft drawn copper shall be stretched after being uncoiled and before being installed except as otherwise specified. No piping smaller than 1/4" nominal internal diameter shall be used. Copper pipe 1" and smaller shall be Type L weight and thickness. Pipe 1-1/4" and larger shall be Type M weight and thickness. All changes in direction of such pipe shall be made with solder joint fittings.

(2) Copper Fittings and Joints: Copper fittings shall be of the cast pattern or the wrought pattern with only one pattern type being used in the installation. The mixing of cast and wrought pattern fittings will not be permitted. Fittings for rigid copper pipe shall be of the solder joint type. Fittings for concealed soft drawn pipe may be of the flared mechanical type. Unions shall be of the ground joint type with a union installed at every point of piping connection to a machine, piece of equipment, or fixture which may require disconnecting for service or maintenance. All pipe ends shall be cut square and burred internally and externally before insertion in fitting socket. All pipe ends shall be sanded clean and all fitting sockets shall be wire brush cleaned to insure 100% tinning of the socket and pipe joint surfaces and to insure full solder penetration of the joint. No acid or acid base solder flux shall be used for surface cleaning. The solder bead at the external pipe to

socket joint shall be "wiped" while the solder is still molten with a dry cloth. All piping shall be thoroughly blown out and cleaned with high pressure air before connecting to instruments.

(3) Valves: Valves shall be solder end, check, gate or globe pattern as specified or indicated on the drawings. For air, globe and check valves shall have composition disc for tight shut-off. All valves shall be designed for 125 psi working pressure. Valves for gauges shall be union gauge cocks with pipe threaded to copper adaptors.

(b) Color Coding of Operating and Control Piping Systems: Operating and control piping systems shall be cleaned, polished, color coded and coated with clear vinyl by the Contractor as specified under the section "Painting" of these specifications.

(c) Installation and Arrangement: All pipe runs shall be paralleled with or at right angles to walls, ceilings, equipment, etc. 45° fittings or angle runs shall be avoided as far as possible. Piping shall be neatly arranged and installed, such that it both meets the service requirements and leaves the machine or equipment it is serving accessible. Insofar as possible, all valves shall be accessible for operation by a man standing on the floor.

(1) Pipe Drainage: All piping whose service requires draining of moisture shall be installed with the required slope in the proper direction for gravity drainage.

(2) Parallel Runs: All parallel runs of piping shall be installed with equidistant spaces between the piping and shall be neatly grouped. Grouping shall be such that cross-overs, except at branches, are avoided.

(d) Hangers and Supports: The maximum distance between hangers or supports shall not exceed:

1/4" and 3/8" diameter	- 4'
1/2" diameter	- 6'
3/4" and 1" diameter	- 8'
1-1/4" to 2" diameter	-10'
2-1/2" diameter & larger	-12'

Piping, 1" and smaller, shall not be hung from rod hangers. Rod hangers, where used, for pipe 1-1/4" and larger shall be split pattern. No pipe shall be clamped directly to a masonry surface. Steel brackets shall be used such that there will be a space, not less than 3/4", between the pipe and any masonry. Piping, 1" and smaller, and preferably piping 1-1/4" and larger, shall be clamped to brackets or other steel members with clamps which will allow no axial movement. Clamps and clamping arrangements shall be of the "Unistrut" type, properly supported for the required arrangement.

(e) Pneumatic Supply and Control Piping Systems: Piping for pneumatic supply systems, including main supply headers and supply laterals, shall be as indicated on the equipment manufacturer's drawings. Headers and laterals or air supply from compressor shall be run on upward and/or downward grades with drip legs and automatic drain traps or separators at

all low points. Small supply laterals from main supply headers and laterals to each instrument or control shall be 3/8" copper. Air sets consisting of drip leg, regulator and pressure gauge shall be furnished for each instrument and control user by the manufacturer and shall be mounted as close to said user as possible. Pneumatic control piping shall be 1/4" copper.

7.09 Butterfly Valves: Butterfly valves shall be of the tight closing, rubber seat type, with seats of corrosion resistant materials. Butterfly valves shall be A.W.W.A. Specification C-504-55T, except as otherwise specified, and shall be as manufactured by the Allis Chalmers Company or Builders-Providence, Inc., or shall be Model "Mark II," as manufactured by the Henry Pratt Company.

(a) Butterfly Valves A.W.W.A. Type: Butterfly valves, A.W.W.A. type shall be furnished in accordance with A.W.W.A. specifications. Class 25-8, except as may be otherwise specified. Construction of butterfly valves, including valve bodies, flanges, discs, shafts, seats and bearings shall be in accordance with the following requirements.

(1) Valve Bodies and Flanges: Valve bodies shall be constructed of close grain cast iron A.S.T.M., A-126, Class B and shall have flanged ends faced and drilled and spot faced on the back side for bolting A.S.A. 125 lb.

(2) Valve Discs: Valve discs shall be of stainless cast iron, containing at least 14% nickel, 6% copper and 2-1/2% chromium (Military Specifications MIL-G-858a, Class One).

(3) Valve Shafts: Shafts shall be turned, ground, and polished 18-8 type 316 stainless steel. Each shaft shall extend full size through the valve discs and bearings, and shall be securely attached to the valve disc by means of "tangentially" fitted stainless steel taper pins or keys.

(4) Valve Seats: Seats of valves which seat at 90° to the pipe access shall be of corrosion resistant materials strengthened by a heavy fabric reinforcing insert molded into the seat cross section. Fabric shall constitute not more than 50% of the total seat thickness. Such seats shall be clamped rigidly in position in the valve body by means of heavy nickel cast iron retaining segments held with stainless steel retaining screws. Seats of valves which seat at 77-1/2° to the pipe axis shall extend over the flanges with a minimum thickness throughout of 1/4" and shall be cemented and vulcanized to the valve body. Seats with metal rings vulcanized within said seats for the purpose of retaining such seats will not be acceptable.

(5) Valve Bearings: Butterfly valves shall be fitted with sleeve type bearings contained in the bearing trunnions of the valve body. Bearings shall be self-lubricated and shall be constructed of bronze impregnated with silicone oil. In addition to the shaft bearings, each valve shall be equipped with an adjustable thrust bearing which is totally enclosed and protected and which is set and locked to hold the valve disc and shaft assembly securely in the center of the valve seat. Valves designed for shaft connection to an operator shall be provided with a shaft bearing beyond the stuffing box gland. The housing for this bearing shall be rigidly attached to the valve body or may be fitted into the valve operator assembly which in turn

shall be rigidly attached to the valve body.

(b) Butterfly Valves; Monoflange Type: Monoflange type butterfly valves equal to Model "Mark II", as manufactured by the Henry Pratt Company may be used where butterfly valves are required, provided that materials of constuction are in accordance with the paragraph "Butterfly Valves A.W.W.A. Type", and provided that valves are equipped with permanently bonded rubber seats and designed for 150 p.s.i. working pressure.

(c) Valve Operators, Manual Type: Valve operators shall be designed to hold the valve disc in any intermediate position between fully open and fully closed without creeping or fluttering, and shall be capable of transmitting sufficient torque to open and close each valve under operating conditions shown on the drawings. All manual operators for A.W.W.A. type valves shall be of the totally enclosed oil bath lubricated gear reducer type as manufactured by the Philadelphia Gear Works. Manually operated Monoflange type butterfly valves may be equipped with manufacturers standard operators.

(1) Extension Operators: Valves shall be equipped with extension operators where indicated on the drawings. Valves equipped with extension operators shall be mounted with the valve shaft in a vertical position and shall contain the extension stem within a pipe extension bolted to the valve operators flange. In the case of buried valves, the pipe enclosing the extension stem shall extend above ground level to normal floor stand operator height and shall be equipped with a top flange which shall be bolted to the geared type operator specified above. In the case of valves located within structures and requiring extension, the pipe enclosing the extension stem shall extend to the level at which the operator is to be placed and shall be connected to a floor stand mounted operator equipped with the gear reducer specified above. Hand wheels for all operators shall be mounted in a vertical plane with horizontal shafts, and hand wheels for all exterior valves shall be equipped with a device for locking.

(d) Valve Operators; Pneumatic Cylinder Type: Pneumatic cylinder operators shall be as manufactured by the Miller Fluid Power Company. Cylinders shall be furnished in accordance with the following:

(1) Cylinder Operation: Cylinders shall be operated by means of air pressure applied to the cylinder through a pneumatic valve positioner.

(2) Cylinder Pressures: Pneumatic cylinders shall be of sufficient cross sectional area to seat and to open valve discs with minimum pressure in the cylinder of 50 p.s.i. and shall be capable of withstanding a pressure of 150 p.s.i.

(3) Cylinder Construction: Pneumatic cylinders and pistons shall be constructed of non-corrosive materials, shall be packed to prevent leakage past piston or stem, shall move with a uniform motion and not stick, slam or be unsteady. In the event butterfly valves are equipped with pivoting type cylinders, the valve shall be equipped with 1/2-inch flexible tubing properly connected to valve cylinder, with open ends affixed to a convenient stationary location

of the valve, to simplify field connection to piping system. Valve cylinders shall be properly lubricated prior to shipment so that the use of oil mist lubricators will not be required. Piston stems shall be constructed of stainless steel with a chrome wearing surface. "O" ring seals shall be used for piston seals.

(e) Auxiliary Switch: Pneumatic cylinder operated valve for use as recirculation rate control valve shall be equipped by the manufacturer with a limit switch with normally closed contacts; contacts to open when valve is in closed position. Limit switch will control meter seal water pump.

7.10 Plug Valves: Valves for sewage, sludge and digester gas, in sizes 2-inch through 8-inch shall be plug valves of the lubricated or non-lubricated type, suitable for 125# working pressure. All plug valves shall open left and shall be furnished in accordance with the following: All gate valves for Water Service. shall be for 150 pounds working pressure.

(a) Lubricated Plug Valves: Lubricated plug valves shall be semi-steel, as manufactured by Homestead, ACF, or approved equal, with minimum port area of 100% of nominal standard pipe area for sizes 2-inch through 8-inch. All valves shall be equipped with giant button head type grease fittings. Furnish two - 2 pound capacity high pressure, lever operated grease guns with flexible pressure hose and button attachment. Valves shall be fully charged with lubricant of the type recommended by the manufacturer.

(b) Non-Lubricated Plug Valves: Non-lubricated plug valves shall be eccentric type plug valves, with reslient plug faces of materials recommended by the manufacturer for use in sewage, sludge and digester gas. Non-lubricated plug valves shall be as manufactured by the DeZurik, A C F or equal.

(c) Accessories: Operation of plug valves in the digester valve house and other buildings shall be as follows:

(1) Valves at entrance and ground floor level shall be equipped with wrenches.

(2) Valves under entrance floor shall be equipped with valve stands and wrenches where shown on drawings.

(3) Valves, overhead, which are 6-feet or more above floor levels shall be geared for chain operation.

(4) Valves shall be installed with stem in vertical position wherever possible. Geared valves under (3) above shall meet this provision.

(5) One wrench shall be furnished for each group of two valves having the same service and which can be served from one operating location. Otherwise wrenches shall be furnished for individual valves.

Valves underground or below water surface in settling tanks shall be equipped with suitable extensions for socket wrench operation and equipped with cast iron valve boxes, floor boxes, or indicating floor stands.

7.11 Gate Valves: Gate valves 2-inch and larger shall conform to the latest standard specifications of the American Water Works Association. Valves size 2-in. and larger shown on the drawings to be gate valves shall be double disc type, N.R.S., opening left, iron body, bronze mounted, suitable for at least 50 lbs. working pressure. Valves 1-1/2" and smaller shall be all brass or bronze, conforming to Federal Specification WW-V-76b. Valves shall have bell and spigot, flanged, or screw ends to fit the pipe for which they are to be used. Valves buried in the ground shall be equipped with 2" square operating nut. Valves on lines buried more than four feet below ground surfaces shall be equipped with extension stem with operating nut mounted 6-inches below ground. Valves in buildings, or elsewhere, if shown on the drawings to be gate valves, shall be operated by hand wheel, manufacturer's standard, but not less than 12". Furnish socket wrenches of lengths to suit the setting depth of valves. Gate valves not specified or indicated on the drawings to be equipped with hand wheels shall be equipped with cast iron valve boxes or floor boxes as indicated. Gate valves shall be Mueller, Rennselaer or A. P. Smith, Eddy of Iowa,

7.12 Check Valves: Check valves for small piping shall be brass or bronze, single disc type. Check valves for all centrifugal sewage pump discharge lines shall be list 340 with outside spring and lever, as manufactured by the Rensselaer Valve Company.

7.13 Gates: Both aluminum gates and other gates shall be furnished in accordance with the following:

(a) Aluminum Gates: Aluminum gates and frames shall be built of structural or extruded shapes as shown on the drawings. Give frames an anodizing finish equal to Alcoa No. 205 Alumilite.

(b) Other Gates: All other gates shall have machine ground cast iron seat and slide, and be equipped with wedges and wedge blocks. Gates shall be reinforced if necessary for 20 feet face pressure. Back pressures shall be as noted on the drawings.

(1) Fabrication: Frames shall be of steel. The minimum angle shall be 2" x 2" x 1/4" but proportioned throughout in accordance with latest A.I.S.C. "Specification for the Design, Fabrication and Erection of Structural Steel for Building." Plates and bars shall be not less than 1/4". Stems shall be cold rolled steel, proportioned so that the unsupported length does not exceed an l/r value of 120 for either full stem diameter or the net diameter at root of thread. Except where otherwise permitted on the drawings, lifts shall be of cast iron construction, shall have ball or roller bearings above and below the lift nut proportioned amply for all loads which can be applied, lubrication by grease cup, bronze lift nut, machined cast iron hold down plate and base. Unless otherwise shown on the schedule, hand wheels shall be 24-inch diameter for gate sizes 18-inch width and smaller, 30-inch diameter for gates of 24-inch and larger widths. Lifts shall be supported on gate frames or pedestals as shown on the drawings. Intermediate stem guides for pedestal lifts shall be cast iron and fully adjustable about the two axes normal to the stem.

(2) Setting: The top of head angles shall be uniformly set at 3'-0" above the operating slab unless required to be higher to provide clearance.

(c) Painting and Coating: All parts of gate, slide, frame, etc., below the operating slab or floor shall be shop coated with a coal tar primer as specified under "Painting" and each gate shall have the specified coating certified on a shipping tag wired to the frame. The 3-foot portion of the frame above the operating slab shall be shop coated in accordance with the Contractor's approved painting schedule and certification attached as above. At the Contractor's option, gates and frames may be supplied with the vendor's standard paint, then sandblasted and painted on the job in accordance with specifications under "Painting." Aluminum gates and frames will not be painted.

(d) Anchor and Assembly Bolts: Standard practice as to anchor and assembly bolts shall be strictly followed. Grip for all bolts shall be the full depth of the nut.

(e) Drawings: Furnish detailed shop drawings for approval, giving weight schedules for seat, slide, hand wheels and lifts, together with all bolt, stem, and structural member sizes. Gates will be subject to rejection unless accompanied by the above information.

7.14 Flap Valves: All flap valves shall be iron body, bronze mounted, and with connections as shown on the drawings.

7.15 Shear Gates: All shear gates shall be iron body with frames as shown on the drawings. Furnish extension handle with lugs and wall loop.

7.16 Valve Boxes: Furnish and set for each outside lubricated plug valve and gate valve a cast iron adjustable valve box, installed so that top is flush with a concrete protecting slab. Boxes for valves on the water supply system shall conform to those used elsewhere on the system.

7.17 Pipe Railing: Pipe railing shall be galvanized iron pipe, 1-1/2" size, with either screw type or welded fittings. All railing posts shall be set in pipe sleeves to a depth of at least 6 inches.

7.18 Soil Pipe: Cast iron soil pipe and fittings shall conform to Federal Specifications WW-P-401, commercial extra heavy grade, with bituminous coating.

7.19 Substitute Pipe Materials: Genuine galvanized wrought iron pipe and cast iron pipe as specified may be used interchangeably at the Contractor's option, except that cast iron only may be used for water mains where so indicated on the drawings.

7.20 Fire Hydrants: Fire hydrants shall have 6-inch connection, 4-inch or larger valve openings, Mueller or Mathews, to comply with Owner's standards.

7.21 Yard Hydrants: Yard hydrants shall be flush type street washers, 1-inch inlet and discharge connections, Mueller Company, Kupfarle Foundry Company, or equal.

7.22 Sterilizing Pipe Lines: All pipe lines and equipment for water supply shall be sterilized as approved, and under the direct supervision of the Engineer. Pipe lines shall remain filled for a twelve hour period with a solution of water and chlorine or 70 per cent grade HTH in amounts equivalent to at least

the following quantities for each 100 foot length of pipe.

Pipe Size	Oz. of HTH
4	1
6	2

Proportionate quantities of HTH shall be used for all mains 2-inch and smaller. The above quantities shall be increased if necessary to secure a chlorine residual of 20 ppm after 12 hours.

7.23 Payment: No separate payment will be made for work under this specification, except as set forth in the Proposal.

DIVISION ONE

SECTION NO. 8

ROADWAYS, WALKS, FENCING

FILTER STONE AND FILTER UNDERDRAINS

SLUDGE BED MEDIA AND DRAINS

8.01 Scope: Work under this section of specifications consists of furnishing all materials and equipment, and performing all labor necessary for constructing roadways, roadway drains, walks, fencing, filter stone and underdrains, sludge bed media and drains as shown on the drawings and specified herein.

8.02 Roadways and Walks: All plant roadways and paved yard areas shall have bituminous surfacing, double treatment, with 8-inch, macadam base course. Except as may be otherwise shown on the drawings or provided herein, materials and construction methods shall conform to Standard Specifications for Highway Construction of the Georgia State Highway Department, as follows:

Section 207:	Macadam Base Course
Section 325:	Bituminous Surfacing (Double Treatment) with prime coat

Construction and preparation of sub-grade shall conform to Section 200 of the referenced Standard Highway Specifications.

(a) Walks: Walks shall be constructed of 4" Class B Concrete.

(b) Excavation and Borrow: All excavation for roadways and walks will be unclassified regardless of the materials encountered, and shall be performed in accordance with the applicable provisions of the Section "Site Preparation, Excavating, Backfilling and Grading" of these specifications. Additional material necessary for fill shall be obtained from approved locations near the plant site.

(c) Grading: Grading shall be to elevations and contours shown on the drawings and in accordance with the applicable provisions of the Section "Excavating, Backfilling and Grading" of these specifications.

8.03 Fills: Where roadways and sludge beds are constructed on fill, the embankment shall be placed in layers not over six inches deep as measured before compaction, and be thoroughly rolled to a solid, compact homogenous mass with a sheep's foot or pneumatic tired roller. The work shall be carried out so that no places too steep to roll are left in the embankment. Portions inaccessible to the roller shall be rammed by hand. All material shall be visibly damp. Water shall be applied as directed to obtain close adhesion between layers and all parts of the material.

(a) Sheep's Foot Roller: The sheep's foot roller shall be of a self-cleaning type with feet projecting seven inches from the shell and of such weight that the load on each tamper foot with the drum empty will not be less than 100 pounds per square inch of area in contact with a plane surface. Rolling shall be carried on until the feet will leave no

appreciable imprint when the shell is filled to maximum weight.

(b) Pneumatic Tired Roller: Pneumatic tired rollers shall be suitable for ballast loading which will give a minimum compression under working conditions of 325 pounds per inch width of tire tread. Forward and rear tires shall make separate tracks. Compaction shall be equivalent to that required for the sheep's foot roller.

(c) Materials: Within the limits of the roadbed and within the limits of the sludge bed walls the fills shall be constructed of selected clay materials from excavation and borrow, free from stones larger than four inches in diameter. Slopes of roadway and sludge bed fills outside the above limits may be constructed of alternate layers of rock and clay; in no case shall rock be allowed in nests. The stones shall be uniformly distributed over the preceding clay layer and the voids shall be completely filled with clay so as to form a solid compacted embankment.

8.04 Filter Stone: Filter stone shall be of either slag, granite or blue limestone, conforming to Federal Specification SS-C-744 where applicable. The source of filter stone shall be subject to approval by the Engineer. The stone shall be hard and sound, free from splinters and flat pieces. No surface weathered or partially disintegrated material nor material of shaly structure will be permitted.

Filter stone shall be furnished having a nominal size of 3-1/2 inches to 2 inches, conforming to Federal Specifications SS-C-744, within limits of sizes as follows:

Sieve Size, Inches (Square Openings)	Amount Passing Sieve (Per Cent by Weight)
4"	100%
3-1/2"	90 - 100%
2"	0 - 2%

In unloading and handling of filter stone, care shall be taken to insure no intrusion of foreign material.

Filter stone shall be sized and cleaned at the filter site, prior to placement, by passing over a vibrating screen having openings of at least 2-1/2 inches square, at the same time washing to eliminate any remaining dust, sand and other fine or foreign material. Placement shall follow such sizing and cleaning. Sizing and cleaning shall be done as near the filter as possible to minimize further breakage and powdering of the filter stone between sizing, cleaning and placement operation.

Placement of filter stone shall be by means of belt conveyors, crane and skip or by other means as approved by the Engineer. Direct dumping of filter stone from trucks either into wheelbarrows or into the filter will not be permitted.

A five-inch layer of bottom stone, size 3 inches or larger shall be hand placed immediately over the underdrains. The remainder of the filter stone shall be placed in layers not exceeding two feet in depth for each layer, each placement to remain where placed. Upon completion, the stone surface shall be level.

Excess material resulting from the site sizing and cleaning operations shall be hauled away or placed upon the site where directed by the Engineer.

8.05 Filter Underdrain Tile: Tile shall be one piece glazed clay tile, conforming to A.S.T.M. Specification C159-55 as amended to date. Tile shall cover the whole floor area and provide drainage and air space capacity equivalent to the above-mentioned specifications. Tile shall be set in one-quarter inch of 1:2 cement grout on concret base.

8.06 Sludge Bed Media and Drains: Sludge bed drains shall conform to specifications in the section "Sewers and Appurtenances" of these Specifications for vitrified clay sewer pipe, except that the joints shall be in not more than two-foot lengths. Joints shall be spaced with about 1/4-inch opening from spigot to bottom of socket. Stone shall be hand placed around all bells in such manner that no fine material can enter. Drains shall be laid in stone-filled trenches as shown on the drawings, and shall have inspection tees and risers at the upper and lower ends of each run. Perforated plugs shall be used to keep stone out of the ends of each lateral. Sand and stone for sludge beds shall be placed to the depths shown on the drawings. Sand shall be equivalent to a good grade of coarse concrete sand having a uniformity coefficient of less than 4.5 and an effective size of 0.35 to 1.5 mm. Stone or slag in accordance with sizes as shown on the plans shall be used to support the sand layer and in trenches around all drain tile inside of the beds. Submit laboratory tests for sand. Where sludge beds are constructed on fills, the embankment shall be compacted in the same manner and to the same degree as specified under the paragraph "Fills" of this section of specifications. The Contractor shall further be required to carry out all compaction on the sludge bed site in advance of any other construction work on the sludge beds.

8.07 Fencing: Provide a complete protection type fence around the treatment plant as shown on the drawings. The fence shall be seven feet high overall, consisting of 2" mesh x 9 gauge x 72" galvanized after weaving fabric and 3-strand barbed wire on malleable iron post tops, 2-1/2" O.D. (3.652 lbs. per ft.) galvanized line posts, 3" O.D. (5.79 lbs. per ft.) galvanized end, corner and 4 ft. gate posts, 4" O.D. (9.109 lbs. per ft.) for gate posts more than 8-ft. double opening, 1-5/8" O.D. (2.272 lbs. per ft.) galvanized top rail with extra long pressed steel sleeves. Terminal, corner and gate posts shall have the necessary strut and tie bracing. Equip gates with heavy duty latches, keepers, gate stop for double gates and heavy duty hardened bronze padlocks with duplicate master keys. Gate frames shall be of 2" O.D. (2.717 lbs. per ft.) galvanized pipe with welded corners. Set posts at not more than 10-foot centers full 3 feet deep in concrete footings poured the full size of holes as excavated.

8.08 Payment: No separate payment will be made for work under this section of specifications. The costs of all such work, and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.

DIVISION ONE

SECTION NO. 9

BUILDINGS

9.01 Scope: The following specifications cover miscellaneous materials and work to be done for all buildings.

9.02 Roofing and Sheet Metal: Materials shall conform to the following specifications:

(a) Built-Up Roofing: Built-up roofing shall be a twenty-year bond, tar or asphalt-felt-gravel type, the number of plies used to depend on the roof surface shown on the plans. Furnish a five-year maintenance bond for the full value of the roofing and flashing in place.

(b) Felt: Federal Specification HH-F-191, Type 2.

(c) Coal Tar Pitch: Federal Specification R-P-381, Type I.

(d) Asphalt: Federal Specification SS-A-666.

(e) Nails: Coated roofing nails, Federal Specification SS-R-521, Type II.

(f) Sheathing Paper: Federal Specification UU-P-536 for "Paper, Sheathing, Waterproof," Grade "A".

(g) Metal Flashings: 16 oz. copper; "Cheney," or equal, thru wall flashing.

(h) Gutters, Downspouts and Conductor Heads: Of 16 oz. copper.

(i) Ventilating Ducts: Galvanized Toncan iron, 24-gauge for ducts less than 24-inch, 22-gauge for ducts 24-inch and larger in the least dimensions; cross-broken panel construction with 1-inch standing seams.

(j) Insulation: 1-1/2-inch fibre insulation bonded to both roof deck and roofing.

(k) Gravel: Clean washed pea gravel, slag or crushed stone, 3/16" to 1/2" size.

(l) Lumber for Digester Roof: Creosoted Southern Yellow Pine, kiln dried, No. 2 common; sheathing, 6-inch tongue-and-groove or 8-inch shiplap, free from large cracks and knot holes; creosote all lumber to full 12 lb. penetration.

9.03 Built-Up Roofing: All built-up roofing shall be applied strictly in accordance with the manufacturer's instructions for the type of roof deck shown on the drawings.

(a) Insulation: Insulation shall be bonded to the roof surface by mopping the entire surface with the same material used for bonding layers of felt.

(b) Flashing and Gravel Stop: Flashing shall be provided around all parapets and openings in roof, as shown on the drawings. Provide gravel stops at edges of roof of floating covers, extending down to cover edge of the roof deck and extending 3-inches on roof. Stops shall be crimped 5/8" high to retain the gravel, and securely fastened, then stripped with felt and mopped down. Material shall be 16 oz. copper.

9.04 Steel Windows: Steel windows shall be intermediate projected type except that lights over the doors are to be furnished as a part of the door construction.

(a) Construction: All frame members of steel sash shall be at least 1-5/8" deep. Weathering members shall be at least 1/8" in thickness. Corner joints of both frames and vents and the junction between horizontal members and frames for full width ventilators shall be either mortised, tenoned and welded or coped, tenoned, riveted and welded construction. Adjacent sash shall be connected to vertical mullions having a tee section or other section of equivalent strength, fully adjustable. Mullion covers shall be provided for interior faces, also adjustable.

(b) Ventilators and Screens: Ventilators shall be provided as shown on the building elevations, equipped with bronze hardware. Screens shall be provided for ventilators in all windows of all buildings. Screened vents shall be equipped with hinged wickets for access to vent latches. Screens shall be removable, of hollow metal steel construction, properly welded and reinforced, and equipped with bronze finished handles. Screen cloth shall be 18 x 14 mesh, .0113 gauge, bronze wire.

(c) Painting: Steel windows and screens shall be "bonderized" and given one coat of approved rust inhibiting paint, oven dried at the factory. Immediately upon delivery at the job they shall be given the priming coat specified under "Painting."

9.05 Doors: Complete shop drawings shall be furnished by the manufacturer of doors, frames and trim for approval by the Engineers before fabrication or shipment.

(a) Construction: Doors shall be of Kalamein construction. Wood cores shall be selected non-resinous spruce or white pine, kiln dried by the door manufacturer. Stiles and rails shall be 1-3/4 inches thick, joined with mortise and tenon joints, and glued with waterproof glue. Cores shall be covered with 24-gauge zinc coated sheet metal, tightly drawn, with all joints or seams soldered and ground smooth. Provide moulded astragals for exterior doors in pairs.

(b) Jalousie Doors: Jalousie doors equipped with screens shall be furnished where shown for exterior and interior doors. Jalousie hardware shall be "Win-Dor" as produced by the Casement Hardware Co., Chicago, Illinois, or approved equal. Jalousies shall be 37" high. Working models shall be furnished for approval. Screen cloth shall be 18-mesh aluminum or copper-bronze, .0113 gauge.

(c) Door Hardware Installation: Doors shall be mortised, reinforced, drilled and tapped at the factory in accordance with templates or samples to be furnished by the hardware manufacturer.

(d) Frames: Frames shall be hollow metal construction, full cold rolled copper bearing steel, free of scale and defects. Furnish combination buck and jamb frames of not less than 14 gauge steel for swing doors, transoms, etc., as indicated on drawings. They shall be mortised, reinforced, drilled and tapped for all hardware.

Hinge and strike plate cutouts shall be protected with pressed steel cover plates, spot welded to back or inside of frames opposite these mortises.

Frames shall be neatly mitred and all joints welded in their entire length and cleaned to present a smooth surface. Mullions shall be same gauge material as frames and properly welded in place. Angle clips punched for bolts shall be welded to the frames for securing to floor construction. Corrugated steel anchors spaced approximately 24" apart shall be provided for each jamb. Unless otherwise shown on details, trim is to extend to finish floor line.

(e) Painting: All doors, frames and trim shall be thoroughly cleaned of rust, oil, grease or other impurities and then given a dip or spray coat of rust inhibiting primer baked at the proper temperature at the factory. As soon as delivered to the job, apply the priming coat specified under "Painting."

(f) Toilet Doors: Special toilet doors shall be 22" x 58". Doors, with partitions and floor support, shall be equivalent to "Sangmetal" layout S-R-88 with "Tenac" finish.

9.06 Hardware for Doors: Hardware shall be in accordance with the following: The catalog numbers given for P & F Corbin Company hardware are for identification as to quality only. Template type hardware with machine screws shall be used for all kalamein doors and frames. Mortise and reinforcements shall be provided by the door manufacturer. All doors are to be 1-3/4" thick.

	Corbin No.
Kalamein door butts, 4-1/2" wrought bronze, ball bearing, 1-1/2 pair -	212
Cylinder lock set, wrought bronze with cast bronze shank for exterior doors and laboratory, exterior doors keyed alike	701-842-1/4
Latch set, wrought bronze with cast bronze shank for other interior doors -	701-020-1/4
Mortise bolts, inactive leaf (LH) of doors in pairs, cast bronze -	2859
Door Closer, all exterior, single and active (RH) leaf of doors in pairs -	B-104
Door stop, all other single and inactive leaf doors - - -	B-0359-1/2

All lock and latch sets shall have box strikes. Furnish two master keys for cylinder locks. Hardware finish shall be dull bronze, U. S. 10.

9.07 Thresholds: Furnish thresholds as shown on the drawings for all exterior doors.

9.08 Glazing and Caulking: All glass shall be of sizes called for on the drawings, the measurements to be taken from the finished doors and sashes. The sashes shall be glazed with "Industrex" glass or equal, double strength "B", in all buildings, except where clear glass is used. One center light in sash of an odd number of lights in width, and two center lights in sash of an even number of lights in width shall be clear glass, double strength "A" for outward visual purposes. The clear lights shall be the panes whose center is nearest to 5'-3" above the floor level below the sash.

(a) Door Glass: Glass for jalousie and other doors shall be 7/32" clear heavy sheet glass of "A" quality, except as stated otherwise on drawings. Glass slats for jalousies shall be held to exact width tolerances required by the jalousie manufacturer.

(b) Glazing: All glass shall be carefully selected, shall be bedded and face glazed in the best oil putty, and left clean, sound and free of visible cutting imperfections upon completion of the work. Each light shall bear the identifying label of the manufacturer.

(c) Calking: Set window and door frames with 1/8-inch joint for calking, calk joints between frames and masonry with a calking compound which will not completely harden with age, applied with a calking gun in accordance with best practice.

(d) Painting: All finished putty and calking work shall be given a paint priming coat as soon as possible after completion.

9.09 Masonry Walls: Exterior masonry walls shall be nominal 12" walls with 8" concrete masonry unit back up and 4" face brick. Interior masonry walls shall be nominal 4" walls of 4" concrete masonry units.

C-62-50 (a) Brick: Exterior brick shall be red hard burned, selected common shale brick of uniform size, texture and hardness, and shall meet A.S.T.M. Specification ~~C216~~ C62-50 Grade ~~MW~~ SW. Brick other than exterior brick shall be hard burned, selected common shale brick, and shall meet A.S.T.M. Specification C216 Grade MW. Samples of brick for use in the work shall be submitted to the Engineer for approval before any brick is delivered to the site of the work.

(b) Concrete Masonry Units: Concrete masonry units shall be standard 4" x 8" x 16" and 8" x 8" x 16" nominal size hollow load bearing, light weight concrete masonry units, conforming with ASTM Specification C-90, 1952, for Grade B Units.

(c) Bond: Brick work and concrete block work shall be constructed as shown on the drawings of running bond for both interior and exterior faces of interior and exterior walls.

(d) Mortar: Mortar shall be composed of one volume of Magnolia Mason's mix or equal and three volumes of concrete sand. No retempered mortar shall be used.

(e) Handling: Care shall be taken to avoid chipping masonry units in handling. Chipped masonry units shall not be permitted in the exposed faces of walls.

(f) Laying: Each brick shall have been wet by playing water on the pile before laying. No dry brick shall be laid in the work. Concrete masonry units shall be laid dry. No wet concrete masonry units shall be laid in the work. The masonry units shall be laid in full and close joint of mortar on its bed, each end and side at one operation. Care shall be taken to have every joint full of mortar. The walls shall be made solid and without any voids. The joints for all masonry units shall not exceed three-eights (3/8) of an inch in thickness. The courses shall be laid so as to correspond exactly in height with sills and lintels over windows, doors, openings, belt course, etc. without any cutting or chipping of the masonry units. Walls shall be plumb and level and shall be laid with whole masonry units. All exposed joints shall be tooled concave joints.

(1) Bed Joints: Bed joints shall be made so that the joint will be completely filled with mortar. Spreading of the mortar shall extend only so far ahead that the mortar will be plastic when the masonry units are laid.

(2) Head Joints: For head joints the end of the masonry units shall be buttered with an ample quantity of mortar and the masonry units shoved into place so that the vertical joint is completely filled with mortar.

(3) Closures: In making closures ample mortar shall be spread in the closure space and the closure masonry unit shall be buttered on both ends and shoved into place so that both horizontal and vertical joints are completely filled. The previously laid masonry unit shall not be disturbed in making the closure.

(4) Realignment: No masonry unit shall be shifted or realigned after it has once been laid. Any shifting or realignment which may be necessary shall be made by removing the masonry unit and relaying with fresh mortar.

(5) Parging: The interior of the exterior wall shall be parged with mortar to a thickness of approximately 3/8". If the backup is laid before the exterior wall, the exterior face of the backup shall be parged in a similar manner. Before parging, the joints on the face shall be cut flush.

(6) Line Pins: Where line pins or nails are used, the holes left by their removal shall be filled immediately on removal with fresh mortar.

(7) Anchors: The exterior face brick shall be carried up at the same time as the interior concrete masonry unit wall, and shall be securely tied to the interior wall, every third course, by 20 gauge zinc-coated steel Z-bar anchors, spaced 24 inches on center.

(8) Caulking: Windows and door frames shall be set a minimum of 1/8" clear to allow caulking. Joints between frames and masonry shall be caulked with an approved caulking compound applied in accordance with the manufacturer's printed directions, using a pressure gun.

(f) Cleaning: Upon completion, all brickwork shall be thoroughly cleaned, using 5% solution of muriatic acid and fiber brushes. Cleaning shall be followed immediately by a through rinsing of clear water. As the cleaning progresses, all brickwork shall be examined for cracks, holes or other defects which shall be carefully treated. All concrete masonry units shall be cleaned of all excessive mortar and washed down with soap powder and water, applied with fiber brushes, after which they shall be thoroughly rinsed with clean water.

9.10 Concrete Trim: Sills shall be of precast concrete as detailed on the plans. The mix shall be 1 (25% Puzzolan, 75% Portland) :2:4 using six bags of cement per cubic yard. Materials shall be as specified in Section 4. Beds and joints shall be full and square the full depth and scored to within 1 inch of the face. Provide holes and sinkages for anchors. Lug sills shall be bedded at the ends only and, after the walls are built, the joints under the sills shall be filled and pointed with light colored elastic pointing compound.

9.11 Wall Tile: Wall tile shall be used for the interior surfaces of outside walls and partitions for the shower rooms in accordance with details shown on the drawings. Wall tile shall be select quality ceramic color, glazed structural, full load bearing, facing tile. All units shall conform to the specifications of the Facing Tile Institute, and shall be of the highest structural and mechanical quality. Shading shall be consistent with manufacturing process and approved samples.

The nominal face sizes of structural facing tile and fittings shall be 5'1/3" x 12", Series 6-T, nominal thicknesses of 2", 4" and 6".

Shapes shown on the Facing Tile Institute catalog shall be furnished as required by the drawings for a complete job. In general all exterior corners, sills, jambs and lintels shall be bull nosed. Interior corners shall be coved. The base course shall be coved and set accurately for the cement floor finish as indicated on the plans. Miters shall be furnished as required. Double face nominal 4" partitions may be constructed either with 2" soaps back to back, or single 4" units in the 6-T Series.

Units less than 12" nominal length shall be obtained wherever possible from the manufacturer. Any cutting required at the job shall be performed with a power driven saw in such manner as to provide true and even edges.

9.12 Floor Tile: The floor in the showers in the control building shall be ceramic mosaic unglazed clay tile, conforming to specifications of Tile Council of America. Tile shall be laid in random pattern with 3/4-inch to 2-inch squares and oblong combinations, color to be selected. Thickness shall be 1/4-inch. Lay in standard cement bed, 1-1/2 inches minimum thickness in 8 lb./sq.ft. lead pan turned up on sides, and in accordance with Tile Council of America specifications.

9.13 Floor Covering: Provide rubber tile floor covering for floor of the laboratory in the control building. Rubber tile shall be 1/8" thickness laid in 9-inch squares with border at walls and top set cove base, color and pattern to be selected with painting schedule. Provide heavy metal binding strip on threshold at discontinuous edges. Protect tile covering during construction work, then clean and give two (2) coats of wax.

9.14 Subway Grating: All subway grating shall be aluminum, of a type as shown

on drawings. Provide aluminum bearing angles anchored in concrete. Cuts around piping and other openings and ends of bearing bars shall be banded. Layouts must be made from approved piping and valve plans as required herein. Provide suitable anchors for all grating supported on structural steel and elsewhere if shown on plans. Painting is not required.

9.15 Concrete Treads: Nosings of all concrete steps, interior and exterior, shall be provided with 3-inch Feralun type treads, anchored.

9.16 Louvers: Stationary type screened louvers shall be used for ventilation where shown on the plans. Louvers shall be leakproof and made of 26-gauge galvanized steel throughout with 16-mesh bronze screen in removable frame. The louver frame shall have a 4-inch nominal depth from outside to inside faces. Over-all dimensions shall correspond to openings for steel sash on the various elevations. Equip louvers with anchors suitable for concrete wall. Frames shall be calked in place. Finish for all louvers shall be rust resisting primer baked on at the factory as specified for hollow metal frames.

9.17 Shower Room: Steel lockers shall be single tier 15" x 18" x 72", flat top, padlock hasp and latch, 16-gauge doors and frame, 24-gauge body, full length louvers. Install on concrete base 5-inches high.

9.18 Piping for Equipment in Buildings:

(a) Completely dimensioned layouts shall be furnished by the Contractor for all piping fittings, valves, specialties and the equipment purchased.

(b) Openings: Openings in floors, walls and all other parts of buildings shall be made accurately from the layouts.

(c) Grating Floors: Subway grating floors shall be fabricated from these layouts and all cutouts shall be banded.

(d) Support: All piping and appurtenances shall be properly supported by a system of I-Beams, hangers, pipe stands, saddles, base ells and concrete piers as required. Concrete inserts, bolts, anchors, etc., shall be placed in the forms before pouring concrete.

(e) Valve Operation for plug valves in the digester valve house and other buildings shall be as follows:

(1) Wrenches for valves at entrance and ground floor levels.

(2) Valve stands with wrenches for valves under entrance floor unless otherwise noted on the plans to be chain operation.

(3) Overhead valves which are 6 feet or more above floor levels shall be geared for chain operation.

(4) As far as possible, all valves shall be installed with stem in a vertical plane. Geared valves under (3) are to meet this provision.

(5) One wrench shall be furnished for each group of at least two nor more than three valves having the same service and which can be served from one operating location. Otherwise wrenches

shall be furnished for individual valves.

9.19 Plumbing and Heating: Furnish and install all piping and all equipment specified herein for plumbing fixtures, fixture fittings, lines for water supply, water heater, unit heaters, waste, drain and vent lines as herein provided or shown on the drawings. Lines included shall be all those required for complete installation. All piping shall be as specified in the section "Metal Pipe, Fittings, Valves and Gates". All exposed parts of metal fixtures and fittings are to be of "Chromard" finish brass. Refer to drawings for correct quantities of fixtures. Water supply lines shall be copper, as specified.

(a) Traps: Each fixture, floor drain, and piece of equipment requiring connection to the drainage system shall be separately trapped.

(b) Floor and Area Drains: Area drains and floor drains indicated in concrete floors laid on earth fill shall be Figure 107, Federal Specification WW-P-541a, 4-inch with strainers and trap. Floor drains in connection with self-supporting concrete floors shall be Figure 108, Specification WW-P-541a, with trap. Provide a 2 lb. (to the square foot) lead flashing 18" square securely clamped to drain.

(c) Pressure Reducing Valves: Pressure reducing valves on water service lines for control building and digester head house shall be Mueller H-9000, with strainer, or approved equal. Pressure reducing valves at other locations shall be as called for on drawings or as required for operation of all equipment.

(d) Lavatories: Equivalent to "Standard" plate P-3869-11 size 20" x 18" "Hexagon", acid resisting cast iron enamel ware lavatories with six inch integral back, wall hangers; R-2001 NU-RE-NU combination supply and pop-up drain with aerator; R-2614 3/8" supply to floor with stops; R-7010 1-1/4" cast brass "S" trap with cleanout plug.

(e) Service Sink: "Standard" Plate P-7705, size 22" x 18" "Argo" acid resisting cast iron enamel ware, rollrim service sink, with rim guard bolted to rim, with 12-inch integral back wall hangers; fitted with P-7798, enameled inside "P" trap, with cleanout plug and tapped for 3-inch I.P.; with R-4551-1 strainer, and R-5001 double faucet with bucket hook and hose end.

(f) Water Closets: Equivalent to "Standard" F-2050-6; R-3020 adjuster control with back flow preventer; R-3514 3/8" floor supply with stop and flexible tube riser; No. 9900 Church open front white Mol-Tex seat, less cover, with check hinge; closet floor flange and bolts and china caps.

(g) Showers: Equivalent to "Standard" plate R-1140 built-in two valve shower, NU-RE-NU compression valves, union couplings for 1/2" I.P. bent arm, escutcheon and R-1301 Boyd ball joint shower head.

(h) Drinking Fountain: Provide an electric water cooler in the control building with bonderized steel cabinet, stainless steel receptor, water pressure regulator, five quart stainless steel storage tank, foot operated valve.

(i) Shower Room Accessories: Equip each shower room with accessories

equivalent to Miami-Carey type listed below, one for each room:

(1) Mirror, No. WE-1418B, 14" x 18" glass, with glass shelf and towel bar.

(2) Soap dish, No. 4003, two required.

(3) Paper holder, No. 4006.

(4) Towel hook, No. 4008, at mirror.

(5) Double robe hook No. 4019, three required.

(6) Towel bars, No. 4054, two required.

Also, for shower room provide approved wall mounted paper towel dispenser and waste basket 14" x 30". Dispenser shall be of a type suited for refilling.

9.20 Building Heating Equipment:

(a) Unit Heaters for Digester Head House shall be thermostat controlled, hot water type, with 110 volt single phase motor. Tubes shall be seamless copper with aluminum or copper fins. The heaters shall have vanes or louvers which are adjustable. Controls shall consist of a switch and combination heat-cooling thermostat assembly, similar to Minneapolis-Honeywell TA-42A, which includes a snap action thermostat mounted on a sub-base with selector switch having "Heating-Off-Cooling" positions. Motors and switches shall be explosion proof. Heater units shall be equivalent to Westinghouse-Sturtevant models as identified in the following schedule:

No.	Model No.	BTU/HR.	CFM 70°	GPM
2	25W	17,800	398	4.5

(b) Hot Water and Return Mains for Unit Heaters shall be connected to the digester heater and shall include piping, valves, check valves, etc., shown on the drawings or required for operation of the building heating system independently of the digester heating facilities. Piping shall be threaded genuine galvanized wrought iron, with malleable fittings, without insulation.

(c) Electric Unit Heaters: Furnish and install four blower electric heaters at the Pumping Station and Control Building as shown. Each unit heater shall be ceiling mounted, 12 K.W. rating, 460 volt, 3-phase heater circuit, 115 volt single phase motor and control transformer with thermal cut-out, and shall provide an air temperature rise of 26° F. at an air volume rate of 1400 cu. ft. per minute. Provide standard room thermostats for heaters as shown on plans. Heaters shall be equivalent to Chromalox, Type UB, as manufactured by Edwin L. Wiegand Company with standard room thermostats, Type WR, and 460 volt contactor operated from above control transformer.

Furnish and install in each shower room in the Control Building one electric heater, at least 6,800 B.T.U./hr. at 220 volts, single phase, air volume between 125 and 180 CFM, with thermostat and with 3-position

pilot switch, for operation of fan only in summer time. Heater shall be approved equivalent of ILG-2KW, Catalog No. 202E, and catalog No. 180-2.

In the chlorinator room of the Chlorine Building, furnish and install one (1) electric heater, at least 10,000 BTU/hr. at 220 volts, single phase; air volume approximately 250 CFM, with thermostat controls. Heater shall be approved equivalent of ILG-3KW, Catalog No. 303E.

Suspend all units by rods from ceiling or use wall mounted equipment with air return below heater. Furnish guaranteed B.T.U. output rating from manufacturer for specified voltage.

(d) Water Heater: Furnish and install an automatic 208 volt electric water heater, 30 gallon capacity, single element, any standard make, in the control building. The heater shall carry a 10 year warranty. The inner tank shall be double extra heavy hot dipped galvanized, equipped with magnesium rod protection against corrosion and fitted with cleanout and drain. Finish of exterior shall be white enamel. Complete catalog data meeting the above specifications shall be submitted for approval. Run 3/4" hot water supply main and 1/2" branches to fixtures, 3/4" cold water with pressure relief and backwater valve, and all other valves, unions and fittings.

(e) Appurtenances: Each unit of the equipment specified shall be furnished complete in every particular and with miscellaneous equipment of every nature required for complete installation in working order for continuous service.

(f) Materials: The materials used in the construction of the equipment shall conform to the requirements of the most recent Standard Specifications of the American Society for Testing Materials where they apply and all materials shall be of the quality and character best adapted for the purpose for which they are to be used.

9.21 Fuel Tank: Furnish and install a horizontal oil storage tank of 1,000 gallons capacity with necessary appurtenances. The tank and appurtenances shall be of the Underwriters approved and labelled construction. It shall be equipped with locking fill cap, screened vent riser, 3/4-inch supply main to the building, oil filter and approved gauge located inside the building, 3/4-inch branches to digester heater and 1/2-inch circulating oil return pipe from digester heater to storage tank as required by the digester heater manufacturer. Oil supply, return and branch lines shall be genuine galvanized wrought iron or copper, valved with bronze seat valves especially designed for oil. If copper lines are buried outside they shall be run in protecting conduit of standard strength sewer pipe. The oil tank shall be coated and inspected as specified under the section "Painting and Waterproofing". The tank shall be erected at the elevation shown, or as required by the digester heater manufacturer, on concrete supports.

9.22 Ventilating Fans: Ventilating fans shall be of the types and sizes indicated on the drawings. Explosion proof motors and switches shall be used for ventilators in the digester valve house. Bases suitable for mounting ventilating fans shall be provided as indicated on the drawings.

Motors shall be single phase, 110-volt, 60 cycle, capacitor type, without centrifugal switch for fans 1/4 H.P. or more, except as noted. For smaller sizes motors may be shaded pole type.

(a) Roof ventilators shall be furnished and installed for building ventilation as indicated on the plans. Ventilators shall be driven by direct connected motor, self-cooled, located in a compartment separate from the exhaust air stream sealed so that no fumes can contact the motor or motor frame. Housings shall be aluminum, fully weatherproof, low silhouette type. Install housings on concrete curb as shown on the drawings.

Hood shall be leak-proof, easily removable and fitted with heavy bird screen. Where ducts are required, provide transition pieces and canvas connections for ducts of sizes shown on the plans. Provide gravity type aluminum shutters for all units shown on the plans to be installed without ducts.

Fans shall be equivalent to those manufactured by ILG, type L-CRF and shall have the capacities at 1/4-inch static pressure given in the tabulation. Capacities at 1/2-inch static pressure shall be equal to tabulated values published by ILG.

Fan Designation	Number Required	Fan Size	CFM	RPM	HP	Voltage
#1	2	122	1150	1140	1/8	110 V.
#2	2	150	2250	1140	1/3	110 V.
#3	2	135	1590	1140	1/5	110 V.

(b) Propellor Fans: Furnish and install in chlorinator building and shower room No. 2, propellor type fans equivalent to ILG type Q, with housing for outside ventilation. Provide fan guards and automatic shutters. Extend motor air intake vents from fan frames through wall to exterior face. Mount fans as low in wall as possible in chlorine building. In shower room No. 2, mount fan near ceiling.

Fan Designation	Number Required	Fan Size	CFM	RPM	HP	Voltage
#4	1	63SH	200	2750	1/80	110 V.
#5	1	103SH	425	1550	1/80	110 V.
#6	1	123SH	800	1550	1/20	110 V.

(c) Screen and Grit Fan: Furnish and install one No. BC-150, ILG or equal, direct connected centrifugal fan. The fan shall have a capacity of 2220 cubic feet per minute against 1/4-inch static pressure at a speed not exceeding 1140 RPM and shall meet the requirements of NAFM class II construction.

Houseing and wheel to be of all-aluminum construction. Wheel to be of backward curved type having non-overloading characteristics and featuring airfoil blades. The overhung fan wheel shall be dynamically balanced and driven directly from the motor shaft. It shall be possible at any time to remove the wheel through the inlet by removing the inlet flange. The motor is to be partly recessed in the side of the blower housing and supported entirely by the housing itself with factory-set alignment. The

fan inlet is to be free of any obstructions. The housing and motor are to be mounted on welded steel side supports. Motor shall be 1/3 H.P., 440V, 3 phase, suitable for outdoor mounting as shown on plans.

(d) Wet Well Fans: Furnish and install two Penthouse Power Roof Ventilators, size 163, with type "X", Size 163 XS 1750 RPM explosion proof propellor fans, ILG or equal, with automatic shutters. Each fan shall have a capacity of 2000 CFM at 1/2" S.P. Motor shall be 1/3 H.P., 110 V. Penthouse shall be weatherproofed 20 gauge steel, with hinged door in back for periodic lubrication. Install on pump house roof as shown on drawings.

9.23 Hoist Equipment: Furnish and install vertical handling equipment including all structural steel support members, as follows:

(a) Extent of Work:

System #1 - 1/2 ton capacity Monorail System complete with electric hoist as shown on the plan, to be installed over wet wells of Pumping Station and Grit Chamber.
System #2 - 1-1/2 ton capacity Monorail System complete with Hand Chain hoist as shown on the plan, to be installed in Pumping Station.
System #3 - 1-1/2 ton capacity Monorail system complete with Hand Chain hoist as shown on the plan, to be installed in Pumping Station.
System #4 - 2 ton capacity Monorail System complete with Hand Chain hoist as shown on plans, to be installed in Chlorine Building.
Item #5 - 1-1/2 ton Chain Hoist hook mounted, to be installed in Digester Head House.

(b) Runway tracks: The track shall be of special rolled section as required to carry the loads imposed and calculated for strength in accordance with current addition of the A.I.S.C. manual. The special rolled section shall have a minimum hardness of 225 brinnell. Maximum deflection under the loading conditions hereinafter specified shall be 1/450th of the span between hangers.

Track sections shall be coupled at joints with suitable splices to provide flush and level connection at the tread. Maximum gap at spliced joints shall be 1/8-inch at the tread.

Safety stops shall be provided at the ends of all runways. These shall be of the below rail type and shall not contact the carrier wheels.

(c) Track and Switch Hangers: Track and switch shall be suspended in accordance with details shown on manufacturer's drawing. All track hangers and other tension type bolted connections shall have a factor of safety of 5 to 1 based on ultimate breaking stress.

(d) Electrification: Available power supply will be 440 Volt, 3-phase 60 cycle A.C. Connection of the power source to the conductor bars on the system shall be made as specified under Section 15.

All conductors shall be of the enclosed safety type especially designed for Monorail duty. These shall have current carrying capacity for all

equipment shown on the drawings operating under normal conditions.

Conductors shall be supported from the runway beams by brackets and insulating type supports at intervals as specified by the National Electrical Code. Four Conductors shall be provided at the runways. The fourth bar will be an equipment ground. All Monorail electrification will be supplied by manufacturer.

(e) Trolleys: All trolleys to be swiveling type with trolley connections to load bars to be cradle type without tension connections.

(f) Hoists:

System #1
One only - 1000# capacity Wright Speedway Electric hoist, Cat. No. L4332L, including 47'-0" of lift and Wright overload cut-off device to limit loads to be lifted to 25% maximum impact loading: 2 fpm single speed, 3/4 H.P. minimum.

System #2
One only - 1-1/2 ton (3000#) capacity Wright Safeway Hook Mounted, spur-geared hand hoist, having: length of lift (load chain only) 28'-0"
Drop of hand chain - 7'-3"

System #3
One only - 1-1/2 ton (3000#) capacity Wright Safeway Hook Mounted, spur-geared hand hoist, having: length of lift (load chain only) 20'-0"
Drop of hand chain - 7'-3"

System #4
One only - 2 ton (4000#) capacity Wright Safeway Hook mounted, spur-geared hand hoist, having: length of lift (load chain only) 9'-0", with
Drop of hand chain - 7'-3"

Item #5
One only - 1-1/2 ton (3000#) capacity Wright Safeway Hook Mounted, spur-geared hand hoist, having: length of lift (load chain only) 20'-0"
Drop of hand chain - 7'-3"

(g) Repair Parts Bulletins: The contractor shall supply 2 sets of repair parts bulletins, which shall include instructions for making adjustments in the equipment and lubrication instructions.

(h) Painting: All equipment except superstructure steel shall be painted with one shop coat in accordance with the manufacturer's standards.

Unless otherwise specified structural steel supporting members shall be painted by the purchaser after erection.

(i) Industry Standards: All equipment to be in accordance with specifications for overhead track systems as established by the Monorail Manufacturers Association. Manufacturer's name and catalog numbers of hoists are listed to indicate type and standard of equipment required. Other manufacturer's equipment will be accepted if it is equal to that specified.

9.24 Laboratory Furniture: Laboratory furniture shall be prefabricated in units which may be bolted together for easy installation or rearrangment. Furniture shall all be of heavy cold-rolled prime steel, protected by "Bonderizing" and a three-coat, rust inhibiting, baked on plastic finish. Tops shall be of 1-1/4" natural sandstone impregnated with a sealing type resin, baked in, highly resistant to laboratory chemicals. Splash-backs and reagent shelf shall be acid-proofed birch.

Units shall be 36-inches high, 30-inches total depth, including 7-inch deep reagent shelf over pipe space in rear, and of unit lengths corresponding to catalog numbers for "Fisher Unitized Laboratory Funiture," or approved equal, as follows:

Quantity	Catalog	Name
1	17-015	Sink unit with double faucet
1		Balance Table, 24" x 60" x 30" height, Similar to Catalog #17-205
2	17-040	Drawer and cupboard units with twin 30 Amp receptacles mounted on face of reagent shelf
1	17-160	Floor case
1	17-200	Desk
1	17-210	Desk Chair
2	17-220	Laboratory stools with cushions
1	17-002	Working top 24" x 18", provide angle brackets for distilled water wall shelf, brackets bolted to wall

9.25 Pneumatic Ejector: Furnish and install as shown on the plans one (1) pneumatic ejector having a capacity of 20 G.P.M. against a total discharge head of 20 feet. Pot shall have a retention capacity of 20 gallons, and shall be equipped with an air compressing system of sufficient volume and pressure to evacuate pot contents in 30 seconds or less.

(a) Ejector Pot: Pot shall be constructed of close grained cast iron having flanged bottom inlet and outlet connections, top air connection and top inspection handhole. The inlet and outlet connections shall be flanged and drilled for standard pipe connections. Ejector pot shall be designed for a working pressure of 50 pounds per square inch, and shall be hermetically sealed construction without the use of stuffing boxes. Interior walls shall be smooth and free of any obstructions that might interfere with the passage of solids or cause the accumulation of stringy material.

The pot shall be equipped with two electrodes. one short and one long, to control the ejection start and stop sequence. Electrodes shall be of brass or other corrosion-resistant material, and shall be rigidly mounted

to the coverplate by means of properly insulated electrode holder. Each electrode shall be insulated except for its contact point, by an impervious sheath of corrosion-resistant material.

(b) Compressors: The ejector shall be furnished with one (1) air compressor unit of the rotary, oil lubricated type, and must be capable of delivering sufficient air pressure to properly evacuate the ejector pot under capacity and head conditions outlined above. Compressor and electrical conponents for the unit shall be mounted directly above the ejector pot by means of a rigid steel frame. All electrical connections between control components and the compressor as well as all items of air piping and accessories between the compressor and the ejector pot shall be furnished completely installed. Air line accessories shall consist of an air strainer, air safety valve and air check valve. Compressor shall be air cooled construction. Each compressor shall be equipped with an oil bath type air cleaner on the inlet side.

The compressor shall be direct connected by means of a flexible coupling to a 1-1/2 H.P., 3-phase, 60 cycle, 440-volt, 1800 R.P.M. horizontal ball bearing motor. Motor shall be drip proof 40° and shall be furnished with an across the line type magnetic starter having overload protection and hand-off automatic selector switch. Starters shall be furnished in General Purpose Nema I enclosure. An activating relay shall be provided in a cast iron enclosure of moisture resistant construction.

(c) Valves and Fittings: Both the inlet and discharge sides of the ejector shall be equipped with gate valves and swing check valves. Gate valves shall be iron body, bronze mounted, having a solid wedge tapered seat construction operated by a non-rising stem. Check valves shall be iron body, bronze mounted with solid bronze discs and seats. Check valve seat and flapper shall be disposed at a 45° angle with the horizontal. Inlet check valve shall be installed at a 45° angle to allow solids to easily enter the ejector pot at any rate of inflow. All valves shall be of flanged construction to coincide with inlet and outlet connections on the ejector pot.

(d) Air Line Accessories: A diaphragm 2-way air valve shall be furnished with the pot to control the flow of air from the compressor to the pot during ejection to exhaust residual pressure at the end of ejection, and to vent the pot during the filling cycle. Air line accessories shall include air check valves, air strainers and air safety valves, as required. The system shall also be provided with an air vent exhaust line to be connected as shown on the plans.

9.26 Built-In Air Conditioner: Furnish and install as shown on plans one (1) built-in air conditioner, G. E. No. R475S26 with aluminum exterior louver and interior baffle, 9500 BTU/Hr ASRE cooling capacity, 1 H.P., 208 Volt, single phase, 60 cycle operation.

9.27 Payment: No separate payment will be made for work under this section of specifications. The cost of all such work, and all costs incidental thereto, shall be included in the price bid for the item to which the work pertains.

DIVISION ONE

SECTION NO. 10

MECHANICAL EQUIPMENT

10.01 Scope: Work under this section consists of furnishing all materials and equipment and performing all labor necessary for the installation of all mechanical equipment and appurtenances complete, including service, testing and painting, as shown on the drawings and/or specified, and in accordance with approved manufacturer's erection instructions and drawings.

10.02 Work Under Other Sections of Specifications: The Bidder's attention is directed to equipment specified in other sections of these specifications. The provisions of the paragraph "Bids on Major Equipment" of this section shall apply to the furnishing of all such equipment specified in other sections of these specifications.

10.03 Service: The Contractor shall furnish the services of competent factory representatives for the purpose of supervising and/or inspecting the installation and initial operation of the items of equipment listed below. The estimated number of days of service to be furnished are as follows:

PARAGRAPH	EQUIPMENT	TOTAL DAYS SERVICE
10.16	Screen Equipment	1
10.17	Grit Aeration and Removal Equipment	1
10.18	Sludge Collectors	2
10.22	Rotary Distributors	2
10.23	Digestion Equipment	2
10.24	Digester Heaters	1
10.25	Gas and Miscellaneous Equipment	1
10.26	Laboratory Equipment	0

Periods of installation and initial operation shall occur on successive days if possible. Periods of service on more than one item of equipment furnished by the same manufacturer may run concurrently, if possible, and when approved by the Engineer. Manufacturers furnishing supervisory and/or inspection service for any item of equipment shall extend such service to include all equipment furnished by said manufacturer whether listed above or not.

10.04 Bids on Major Equipment: The Bidder is required to furnish the names of the manufacturers of major items of equipment in the spaces provided in the proposal in accordance with the following:

(a) Major Equipment: The Bidder shall list the required number of manufacturers or suppliers named in these specifications for each major item of equipment in the proposal and the bid price for the item. The lowest price shall be used in the base bid.

The equipment of manufacturers other than those named in these specifications will be considered in accordance with the provisions of "Instructions to Bidders and Special Provisions" of these specifications, if such equipment is offered by the Bidder under the heading "Alternate Equipment" in the proposal.

(b) Alternate Equipment: The Bidder offering alternate equipment shall

include the name of the manufacturer of such equipment and the bid price for the item in the spaces provided in the proposal under the heading "Alternate Equipment". The bid price for the installation of alternate equipment shall include the costs of, and all costs incidental to, changes in structural, mechanical, electrical and appurtenant work, which may be required for the accommodation of such alternate equipment; which changes shall be as determined by the Engineer.

The Owner reserves the right to compare bids, and to award contracts on the basis of the bid price for any equipment named in these specifications or on the basis of the bid price for alternate equipment, whichever appears to be in the Owner's best interest.

(c) Preliminary Information Required: It shall be the responsibility of the Bidder to ascertain that each manufacturer named in his proposal under the base bid or under the heading "Alternate Equipment" has submitted to the Engineer complete information on the equipment offered at least two weeks in advance of the letting date.

The information submitted shall include complete drawings, specifications and weights of principal parts and all additional information required for any specific item. Equipment which does not have a record of successful service for two years may be accepted at the discretion of and upon the terms and conditions set forth by the Engineer.

(d) Standardization of Equipment: In order to avoid a division of responsibility among several manufacturers for like items of equipment having functions relating to each other or to the same part of the treatment process, and to avoid unnecessary duplication of replacement parts and service calls, the items of equipment to be furnished under each individual category below shall be the product of or guaranteed by one manufacturer.

1. Sludge Collectors - specified under par. 10.18.
2. Distributors - specified under par. 10.22.
3. Centrifugal Pumps - specified under Section 11 of these specifications.

10.05 Instruction Manuals: Before equipment specified in this section of specifications is placed in service, and before equipment specified under the sections of specifications, "Metal Pipes, Fittings, Valves and Gates," "Chlorination Equipment," "Metering Equipment," "Electrical Work and Equipment," is placed in service, six sets of instruction manuals, clean and unused, shall be delivered by the Contractor to the Owner. Such instruction manuals shall list all of the equipment specified in this and other referenced sections of specifications and shall include equipment serial numbers, design data, operating instructions, maintenance instructions, lubrication instructions, piping, wiring and control diagrams, assembly drawings showing locations of parts, part numbers and spare parts list.

10.06 Materials to be Obtained from Equipment Manufacturer: The Contractor shall obtain from the manufacturer, all materials and/or components specified or required for the safe operation or use of each item of equipment, unless such materials or components are excluded by the provisions of the following paragraph.

Unless otherwise specified for a particular item of equipment, the

following type of materials are not to be considered to be a part of an equipment item, and they may be obtained from sources other than the equipment manufacturer. Such materials shall include connecting piping and valves, railings set in tanks or structures, motor starters and wiring, steps of manholes installed separately from equipment, finish painting and other such work and materials.

10.07 Information Required for Approval: Each manufacturer furnishing equipment shall submit the following information to the Engineer for approval:

(a) Drawings: Six (6) sets of certified drawings, guaranteed performance curves, wiring diagrams, lists of electrical controls, including manufacturer's name and catalog number, horsepower of motors, normal full load and maximum load ampere rating for each motor.

(b) Weight: Estimated weight of each unit of equipment.

(c) Spare Parts and Tools: Lists of spare parts and tools to be furnished with equipment. Unless otherwise specified, only special tools required for the particular equipment shall be furnished with equipment.

(d) Installation and Operating Instructions: After approval of equipment has been given, the manufacturer shall furnish six (6) sets of complete installation, operation and maintenance instructions.

10.08 Laboratory Tests: Laboratory tests of chain and sprockets furnished for sludge collector installation under this contract shall be conducted in accordance with this paragraph. The manufacturer of the sludge collectors shall furnish the following quantities of extra chain and sprockets for testing:

Chain: One (1%) per cent of the total length of each type, but not less than three (3') feet of each type furnished.

Sprockets: A minimum of one (1) extra sprocket, but not less than 4% of each type furnished.

(a) Selection for Testing: Upon arrival of the equipment at the job site, the Engineer will select at random the above quantities of chain and sprockets and the Contractor shall ship the selected chain and sprockets to an approved testing laboratory for analysis.

(b) Test Reports: In accordance with requirements of par. 10.18, the testing laboratory shall submit to the Engineer a test report in triplicate covering the Brinell hardness of chains and sprockets, the strength of the assembled chains, and the minimum depth of chill in tooth bearing surfaces of sprockets.

(c) Failure to Meet Specifications: In the event the parts tested fail to meet specification requirements, the entire shipment of chain or sprockets, or both, shall be rejected. Such rejected materials shall then be marked and stored on the job until a new shipment of such items has been received, tested as specified and accepted for installation. Specimens tested shall be returned to the Engineer. Extra parts not tested shall become the property of the Owner.

(d) Exemption from Testing: Manufacturers whose products have a consistent record of successfully meeting such tests, or who maintain

regular facilities for metallurgical control at the point of manufacture, may be exempted from the above tests at the sole discretion of the Engineer. The actual cost to the Contractor for extra chain and sprockets shall then be established and credited to the Owner.

(e) Guarantee: Chain and sprockets shall be guaranteed by the manufacturer for a period of one year after the equipment has been given final acceptance, and shall be replaced without charge if showing undue wear, or if breakage occurs when the equipment is being operated for the intended purpose within the one-year guarantee period.

(f) Acceptance of Provisions for Testing by Manufacturer: A proposal for furnishing equipment which has been submitted to bidders by any manufacturer shall be considered as evidence that the manufacturer has accepted the above provisions for testing.

10.09 Mechanical Tests: After installation of each unit of mechanical equipment, the unit will be operated continuously for a period of twenty-four (24) hours. During this period, the equipment will be inspected for defects or weaknesses, and any part of the unit showing a defect or weakness shall at once be replaced, or shall be made good in a satisfactory manner at no expense to the Owner. After any parts of the equipment showing defects or weaknesses have been replaced or made good, additional mechanical tests will be made with the equipment operating continuously for a twenty-four (24) hour period until no further defects or weaknesses occur in the unit.

(a) Certification: After installation and final testing of equipment, each manufacturer furnishing supervision and/or inspection services shall make written certification to both the Engineer and the Owner that his equipment and the controls therefor have been properly installed in accordance with specifications and drawings, and that the operating and maintenance instructions have been furnished to the Owner.

10.10 Patents: The Bidder shall guarantee to the Owner that all equipment offered under these specifications, or that any process resulting from the use of such equipment in the manner stated, is not the subject of patent litigation, and that he is not knowingly offered equipment, the installation or use of which is likely to result in a patent controversy, in which the Owner as user is likely to be made the defendant.

(a) License: Where patent infringements are likely to occur, each Bidder shall submit, as a part of his bid, license arrangements between himself, or the manufacturer of the equipment offered, and the patent owner or the controller of the patent, which will permit the use, in the specified manner, of such mechanical equipment as he may be bidding upon.

(b) Liability: Each Bidder, by submitting his bid, agrees to hold and save the Owner or its officers, agents, servants and employees harmless from liability of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the work under this contract, including the use of the same by the Owner.

10.11 Piping and Appurtenances for Mechanical Equipment: The Contractor shall furnish completely dimensioned layouts for all piping, fittings, valves, specialties, and equipment and appurtenances thereto. Openings in floors, walls and other parts of buildings and structures shall be accurately made from said

layouts. All piping and appurtenances shall be properly supported and blocked from movement by a system of hangers, pipe stands, base ells and concrete piers, as required. Concrete inserts, bolts, anchors, and any other such work shall be properly set in form work before concrete is poured.

10.12 Electrical Equipment: Electrical equipment furnished for operating mechanical equipment shall, in general, be in accordance with the following:

(a) Motors: All electric motors shall be of General Electric, Westinghouse, or other approved equal manufacture, with windings impregnated with moisture-proof insulating compound. Outdoor horizontal motors shall be totally enclosed, weatherproof; vertical motors shall be splash and drip proof. All single and three-phase motors, except for fan motors which may be of an approved manufacturer's standard, shall be ball bearing, with either sealed-in lubricant, or designed for external oil or grease lubrication.

(b) Voltage: Electrical motors, 1/2 H.P., and larger, shall be 440 volt, 3 phase, 60 cycle, induction motors, with full voltage starting. Motors less than 1/2 H.P., unless otherwise specified, shall be single phase, 120 volt, 60 cycle operation. Motors 1/4 H.P., and over shall be capacitor type; smaller motors may be of capacitor or shaded pole type.

(c) Control Equipment: In general, electrical control equipment shall be furnished in accordance with the section "Electrical Work" of these specifications. The manufacturer of mechanical equipment shall furnish only those items of electrical equipment which are required under the paragraph which specifies his equipment.

10.13 Electrical Standards and Codes: Electrical equipment or electrical devices and materials of any kind shall be subject to the requirements of the Fire Underwriters' Association, and the National Electric Code. All such equipment, devices, or materials shall have the name or trademark of the manufacturer and the rating in volts and amperes, or other units, marked where they may be readily observed after installation.

10.14 Painting: All shop painting of equipment, unless otherwise specified, shall be as specified under the section "Waterproofing and Painting."

10.15 Guarantee: The Contractor shall guarantee all mechanical equipment to be free from defects in workmanship, design or material for a period of one (1) year after the beginning of initial operation, and shall replace without charge any part of any equipment which is defective or showing undue wear within the guarantee period.

EQUIPMENT SPECIFICATIONS

10.16 Screen Equipment: Furnish and install two (2) complete front cleaned bar screens. These screens shall be installed in channel 3'-0" wide and shall have an effective width equivalent to the entire width of the channel. Certain electrical controls which are specifically named herein shall be furnished by the bar screen manufacturer. Starters and other controls shall be furnished as specified under other sections of these specifications. The Owner will furnish DEMPSTER-DUMPSTER type containers for handling screen refuse.

(a) Manufacturer: The Bidder shall submit prices on equipment furnished by at least one manufacturer listed below. The listing of such names does not constitute nor infer preference.

Chain Belt Co., Jeffry Mfg. Co., Link-Belt Co.

(b) Screen Construction: The screen unit shall consist essentially of a bar rack, side frames, cleaning rakes, dead plate, rake cleaning device, housing and drive unit. The screen shall be suitably inclined at 84° from the horizontal, and shall be held firmly in the channel. Screen inclination and arrangement shall be designed to maintain the operating floor clearances shown. Four or more cleaning rakes shall be mounted on two strands of chain running over two sets of sprocket wheels at a speed of approximately seven FPM. The screenings shall be removed from bar rack by these rakes, conveyed over the dead plate and deposited into a DEMPSTER-DUMPSTER container, furnished by the Owner. The head section shall completely enclose the container. The unit shall be completely assembled in the shop and checked for proper meshing of rakes and all other moving parts. Fabrication and shipment of each unit shall be such as to permit ready installation or removal from the structure shown on the drawings. All parts of the mechanism shall be amply proportioned for stresses that may occur during continuous operation and for any additional stresses that may occur during fabrication, erection, intermittent or continuous operation. Details of fabrication of the screen unit shall be as follows:

1. Enclosure: The entire screen unit above the operating floor, including the DEMPSTER-DUMPSTER container, shall be enclosed in a housing of No. 12 gauge steel, reinforced at the base and at all corners with steel angles. Provide necessary cleanout and inspection doors. Doors shall have heavy duty latches and loose pin hinges. Dimensions of container are shown on plans.

2. Bar Rack: The bar rack shall consist of steel bars 5/16" thick by 2" wide extending to the full depth of the screen channel, formed straight and true, and held firmly and accurately in place with 3/4" clear openings by means of welded spaces at each end. Dead plate and side plate thickness shall be 1/4". Bar rack, dead plate and side plate shall be fabricated in semi-box shape on a steel angle frame constructed, shipped and erected in one continuous section. The two sides of screen frame at right angles to the end plate shall be enclosed from service floor to operating floor.

3. Cleaning Rakes and Rake Wiper: Cleaning rakes shall be of steel plate not less than 3/4" thick with milled teeth of suitable shape to clean the top and side of the bars. Suitable provision shall be made for keeping the rake in proper contact with bars for complete cleaning without undue friction, and to prevent the rake from jumping over an unusually heavy accumulation of screens on the bar. The rakes shall be of number and width to provide ample carrying capacity for screenings expected in a maximum flow of 15 MGD. The unit shall be equipped with an automatic rake wiper. The wiper shall be fabricated of steel plate mounted on two adjustable steel pivot arms and provided with lubrication fittings. Adjustable shock absorbers shall regulate the return of the wiper quietly and without shock to the screen. The wiper shall be so designed as screenings cannot wrap around the rake or wiper during the process screenage removal.

4. Chains and Sprockets: Screen chains shall have an ultimate strength of not less than 30,000 pounds. Chain links and attachments shall be assembled with heat treated rivets and pins. The chains

shall consist of 6-inch pitch links made of a corrosion-resisting processed metal, having an average tensile strength of 75,000 lbs., and a Brinell hardness of 170/190. The driving chain shall be of the steel roller type, 2.609 inch pitch links. The driving chain shall have an average ultimate strength of 10,000 pounds and shall be suitably covered with a guard of No. 12 gauge steel. Sprockets for drive and screen chains shall be semi-steel, cast in a chill with a hardness at the root diameter of the teeth of not less than 360 Brinell. Depth of chill shall be at least 3/16" at tooth bearing surfaces. The teeth of sprockets shall be ground to fit the chain accurately. Headshaft sprockets shall be keyed firmly to the shaft and foot shaft sprockets shall be provided with special graphite impregnated brushings suitable for underwater service under gritty conditions. Foot shaft sprockets shall rotate on fixed, case hardened, steel stub shafts. The screen chain sprockets shall be not less than 9 tooth, approximately 17.54 inch pitch diameter. All sprockets on headshafts shall be split type. Driving sprockets shall be not less than 11 tooth, 9.26 inch pitch diameter. Driven sprockets shall be not less than 26 tooth, 21.64 inch pitch diameter. The driving sprocket shall be fitted with a bronze driving hub and shall be equipped with a shear pin device to provide for full protection of equipment in case of overload.

5. Bearings and Shafting: Headshaft bearings shall be babbitted with approved type bearing material and provided with lubricated fittings. All shafting shall be cold finish steel, straight and true, and of sufficient size to transmit the power required. Keyways with fitted keys shall be provided where necessary. The head section shall be equipped with an adjustable screw type take-up providing for a six-inch adjustment of the screen chains.

6. Drives: The screens shall be driven through a steel drive chain from the headshaft to the slow speed shaft of the drive unit. The drive unit shall be of the motorized type mounted on the screen head section. The drive motor shall be 3/4 HP, squirrel cage, totally enclosed, 440 volt, non-ventilated ball bearing, constant speed unit. The motor shall have ample power for starting and operating the mechanism under normal operating conditions without overloading, based on a 55° C rating. The drive unit speed reducer shall be of the worm and herring bone gear type or approved equal, fully housed, running in oil, and of approved make, with anti-friction bearings throughout.

7. Structural Materials: All No. 12 gauge sheets shall be galvanized. Heavier plates and other structural members may be black. Aluminum sheets, plates and structural members where required shall be 6061-T6 alloy. All anchor bolts shall be galvanized steel furnished by the manufacturer of the equipment and set by the Contractor in accordance with the manufacturer's instructions.

(c) Tools and Spare Parts: A complete set of tools for maintenance and operation of the screen shall be furnished with the screen unit.

(d) Controls: The equipment manufacturer shall furnish the following electrical controls for each screen, located as indicated on the drawings:

One three-position selector switch marked "Day-Off-Night."

Two electrical movement time clocks complete with riders, one for day and one for night operation.

One limit switch (mounted on the bar screen headsection).

A differential water level control for starting the screens at a predetermined loss of head through the screens will be furnished under section 13. Starters and other controls will be furnished under "Electrical Equipment."

10.17 Grit Aeration and Removal Equipment: Furnish and install the necessary equipment for an aerated type grit removal chamber. All aeration equipment specified under (a) below shall be furnished as manufactured by the Chicago Pump Company. Grit collector equipment as specified under Paragraph (b) below shall consist of a tubular conveyor furnished as manufactured by the Hapman Conveyor Company. The manufacturer shall furnish the necessary license under the controlling patents for the installation and operation of the aerated grit chamber shown on the drawings and specified herein. Alternate make may be bid.

(a) Aeration Equipment: The following aeration equipment shall be furnished for operation of the grit chamber. The aeration equipment shall be designed to remove grit from an average flow of 5 MGD with peak flows of 10 MGD at present, and an average flow of 10 MGD to peak flows of 20 MGD in the future.

1. Discfusers: One (1) air diffusion unit of the swing joint type as manufactured by the Chicago Pump Company with Discfusers to provide a proper circulating velocity for the grit washing and segregating process. Sufficient discfusers for use in the diffusion unit plus a duplicate number of extra discfusers shall be provided. There shall also be provided one (1) portable winch operated hoist for raising the air diffusion unit with discfusers from the grit chamber. Discfusers shall not be placed until all air piping and equipment has been carefully cleaned.

2. Blower and Accessories: Two (2) Sutorbilt or Roots-Connorsville positive displacement side inlet and side outlet blowers having a capacity of not less than 57 CFM at any ambient temperature of 25° to 105° F when operating against a pressure of at least 5.0 p.s.i. but not less than 0.75 pounds above pressures developed in the discfuser and piping system shown on the drawings. Each blower shall be V-belt connected to a 3 HP, 1750 RPM motor for operation on 440 volt, 3 phase, 60 cycle current. A split or adjustable motor pulley shall be furnished with each blower to permit adjustment of air discharge between 35 and 57 C.F.M. Each blower with its motor shall be mounted on a common steel base. Provide these accessories for each blower:

(1) 2" pressure relief valve, weighted type, non-vibrating.

(2) Dollinger Model No. DS-75B-1-1/2 combination intake filter silencer.

(3) Burgess-Manning Series SDG-1-1/2 intake and disch. snubbers.

(4) Air check valve, size to correspond with the discharge piping of the blower.

(5) 3" butterfly valve.

(6) Two 3" sleeve type flexible expansion joints for installation on the intake and discharge sides of the blower.

(7) Mercury manometer calibrated to read from 0 to 10 pounds per square inch and suitable for wall mounting where shown. Provide mercury for manometer.

(8) Thermometer and thermometer guard.

(9) 3" air separator with automatic trap, Wright Austin Company or Swartwout "Airfuse," or equal, installed at swing diffuser. (1 only req'd per 2 blowers)

(10) Suitable anchor bolts.

(b) Grit Removal Equipment: The grit removal equipment shall consist of a tubular conveyor constructed of steel pipe of 4" minimum diameter with case hardened bends, steel pin, chain and abrasive, necessary round neoprene flights. The unit shall have the necessary capacity for removing the grit from the average and peak flows set forth under (a) above. The motor and drive shall be designed to drive the conveyor unit without overloading under all operating conditions. The unit shall be equipped with a fully enclosed weatherproof motor of a minimum capacity of 1-1/2 H.P. for operation on 440 volt, 3 phase, 60 cycle current. The conveyor discharge shall be equipped with a vibrator properly sized for the service involved, minimum vibrator motor size 1/4 H.P. Thermostatically controlled heating elements with insulation shall be furnished to prevent freezing on the portion of the tubular conveyor installed above the normal outside ground surface. The tubular conveyor shall be arranged for discharge into a DEMPSTER-DUMPSTER type container as shown on the drawings. Said container will be furnished by the Owner. Accessories to be furnished with the tubular conveyor shall include take up, inspection ports, gaskets, flanges, discharge assembly, supports, fastenings, and all other necessary accessories, all of which shall be furnished complete by the manufacturer of the grit conveyor equipment.

(c) Electrical Controls: Starting equipment and electrical control equipment shall be furnished as specified under the section "Electrical Work" of these specifications.

10.18 Sludge Collector Units: Sludge Collector units shall be furnished and installed for two (2) primary settling tanks and two (2) final settling tanks. Each sludge collector unit for the primary settling tank shall consist of two longitudinal collectors and one cross collector, with a common two shaft drive operating both the longitudinal collectors and cross collector. Each sludge collector unit for the final settling tank shall consist of one longitudinal collector, with the two final collector units having a common drive for operation of both units. All sludge collectors shall be arranged for skimming on the return run. Sludge collectors shall be furnished and installed as indicated on the drawings and specified herein.

(a) Manufacture: Sludge collector units may be fabricated by any manufacturer whose record meets with the experience clauses stated in these specifications. However, in order to obtain equal quality of component parts, the collector chains, drive chains, sprockets, and wall bearings will be approved and accepted only if furnished in accordance with one of the following options:

1. Base Bid: The base bid shall be for the above components furnished as manufactured by the Chain Belt Company, the Link-Belt Company, Jeffrey Mfg. Company, American Well Works Company, or Walker Process Company. The bidder shall list Chain Belt or Link Belt and at least two more of the above named manufacturers in the proposal. Use lowest price for base bid.

2. Alternate Bid: An alternate bid may be submitted based on furnishing the referenced components as manufactured in conformance with approved, full-size patterns, or lightweight replicas, or actual components shipped to the Contractor at the job site, marked for proper identification, and retained for comparison with said components to be installed until final acceptance of the equipment in the completed work.

(b) Tests: The collector sprockets and chains of any make of collectors furnished for installation under this contract shall be tested in accordance with the paragraph "Laboratory Tests" of this section of specifications.

(c) Collector Mechanisms: Collector mechanisms shall be furnished complete in every particular and with miscellaneous material and appurtenances of every nature, including bolts, rails, tracks and other appurtenances as required for the complete collector installation, in working order, for continuous service.

(d) Component Sizes: Collector and cross collector components shall be proportioned to the following minimum sizes:

Collectors

1.	Collector width:	20 ft.
2.	Diameter headshaft:	4-7/16 in.
3.	Diameter take-up shaft:	3-15/16 in.
4.	Diameter corner shaft:	3-15/16 in.
5.	Flight Size:	3" x 8" x 19'-10"
6.	Flight Spacing:	10' - 0"
7.	Maximum Sprocket distance from tank wall:	3' - 0"
8.	Sprockets: Headshaft:	Split type, 25 tooth, 24" nominal pitch diameter.
9.	Sprockets: Other:	Split type, 19 tooth 18.5" nominal pitch diameter.
10.	Size Take-up:	10"

Cross Collectors

1.	Collector width:	4' - 0"
2.	Diameter all shafts:	2-7/16"
3.	Sprockets:	Same as for collectors.

Drive

1.	H.P. Motor and Drive (collectors & cross-collector):	1 H.P. Minimum
2.	H.P. Motor and Drive (Final collectors):	1 H.P. Minimum

(e) Collector Unit: The collector unit for each tank compartment of the primary settling tank shall consist of two (2) longitudinal collectors and one (1) cross collector, with common drive for operation of all collectors in the unit. The collector unit for each tank compartment of the final settling tank shall consist of one (1) longitudinal collector, with a common drive for operation of both collector units in the final tank. Collector units shall be furnished and installed for two (2) primary and two (2) final tank compartments. All collector units shall be arranged for skimming on the return run. Longitudinal collectors shall each be made up of two (2) strands of chain to which wooden flights shall be attached at intervals of 10'-0". Longitudinal collector speed for the primary shall be 2 FPM, and for the final shall be 1 FPM. Cross collectors shall each be made up of two strands of chain to which wooden flights shall be attached at intervals of 5'-0", with chains running over three sets of sprockets. The speed of cross collectors for primary tanks shall be 4 FPM and 2 FPM for final tanks. Main collector and cross collector components shall be furnished in accordance with the schedule under (d) above, and as follows:

1. Flights: Flights shall be A grade, clear, all-heart Redwood, completely fabricated and drilled to exact templates in the factory, and of nominal sizes stated for sprockets located as specified on the above schedule, but with sizes increased to provide for increased lateral bending where sprockets are located at less distances from tank walls. Chain attachment shall be heat treated and fastened with at least four (4) bolts. Three (3) pivoted flights shall be provided for each main collector. Steel wearing shoes, at least 3/8 inches in thickness shall be properly attached to flights where flights contact both rails and tracks.

2. Chains: Collector chains shall have an ultimate strength of not less than 40,000 lbs. Links shall be made from corrosion-resistant, processed metal which shall have an average ultimate strength of at least 75,000 lbs. per square inch, and a Brinell hardness of not less than 170/190 throughout the entire section of the link. Pins shall be of special heat-treated steel 3/4" diameter. The driving chain shall be of the same materials as specified for collector chains and shall have an ultimate strength of not less than 20,000 lbs. A chain take-up shall be installed in the location shown on the drawings for the primary and final main collector chains. The chain take-ups shall provide sufficient adjustment to shorten the primary and final collector chains by one full link. The drive chain shall be equipped with a chain tightener, which shall consist of a cast or fabricated shoe positively anchored to the drive base.

3. Sprockets: The collector sprockets shall be sized in accordance with the schedule above, which shows headshaft sprockets to be split type, 25 tooth, 24-inch nominal pitch diameter, and other collector sprockets to be split type, 19 tooth, 18.5 nominal pitch diameter. Driving sprockets shall be not less than 11 tooth, with driven sprockets not less than 40 tooth, and driving sprockets shall be fitted with a bronze bushing and shearing pin device to provide for full protection of equipment in case of overloading. All sprockets shall be semi-steel, cast in a chill, with a hardness at the root diameter of the teeth of not less than 360 Brinell. Depth of chill shall be at least 3/16 inches at all tooth contact surfaces. Sprocket teeth shall be accurately ground to fit the chain. Driven

sprockets shall be offset hub, split type to provide for use of full width flights. Minor variations from sprocket diameters are permissable. One sprocket on each collector shaft shall be set-screwed to assure actual shaft rotation.

4. Shafting: All shafting shall be solid cold-finished steel, straight and true, shall extend across the full width of the tank and shall be held in alignment with set-screwed collars. Shafting shall contain keyways with fitted keys where necessary and shall be of sufficient size to transmit the required power.

5. Bearings: All submerged bearings shall be babbitted, water-lubricated, wall mounted and designed to prevent accumulation of settled solids. Operation on fixed shafts is not acceptable. Shafting shall extend across the full width of each tank. Means for easy adjustment of bearings shall be provided at tank walls, and a 3/4 inch steel divider plate shall be provided at division walls for mounting head shaft bearings.

6. Tracks and Rails: Steel tracks of at least 3-inch x 2-inch x 3/8-inch steel angles shall be fastened with 1/4-inch steel supports to tank walls for travel of collector flights on return runs, and 25-pound teerails shall be installed in the bottom of tanks for collector flight travel. Tracks and rails, together with a radius screed for the finishing of grout in the curved end of the tank shall be furnished by the equipment manufacturer.

7. Motor, Reduction Gear and Drive: The motor shall be for 440 volt, 3 phase, 60 cycle operation, horizontal ball-bearing type, totally enclosed, equipped with impregnated moisture-resistant windings, and of approved manufacture. The motor shall be connected through a flexible coupling to a fully housed reduction unit running in oil. The gear reduction unit shall be of the helical gear reducer type, Falk or of equal quality and efficiency, with roller or ball-bearings, and conforming to the standards of the American Gear Manufacturers Association. The unit shall be rated for a service factor of 1.25 for 24-hour uniform loading or 10-hour moderate shock loading. In addition to the motor and reduction unit, there shall be provided a system of shafting clutches, gears, chains and necessary appurtenances as necessary to drive the collectors. Clutches shall have machined jaws, and shall be arranged to drive any or all collectors in the unit. The motor reduction gear, drive shafts, bearings and appurtenances shall be mounted on a common base, fabricated from 5-inch channels and suitable heavy mounting plates. The complete drive system, including motor, reduction unit, drive and base shall be furnished by the equipment manufacturer.

8. Guards: All gears and chains of the driving mechanism shall be equipped with guards, which shall be arranged to prevent drippage of grease and oil. All exposed gears and chains not included in the above requirements shall be equipped with easily removable, approved safety guards of 12-gauge, galvanized iron.

9. Anchor Bolts: All anchor bolts shall be galvanized steel, of the proper size, furnished by the equipment manufacturer and set by the Contractor in accordance with the equipment manufacturer's instructions.

(f) Stresses in Mechanism: The size schedule under (d) above gives only minimum sizes for some of the collector mechanism components. However, all parts of the mechanism shall be amply proportioned for all stresses which may occur during fabrication, erection and intermittent or continuous operation.

(g) Spare Parts: One complete set of the following spare parts shall be furnished for both the primary and final collector units.

2 Rigid Flights
12 Links of Collector Chain
8 Complete Flight Attachments
2 Complete Flight Attachments for Pivoted Flights
24 Collector Chain Pins
50 Shear Pins
20 Linear Feet of Drive Chain

10.19 Scum Skimmers: Scum skimmers shall be furnished and installed on primary and final tanks as indicated on the drawings and/or specified herein. Skimmers shall be furnished by the manufacturer of the sludge collectors.

(a) Fabrication: Scum skimmers shall be 12-inch diameter, revolving, hand operated, of not less than 1/4-inch wall thickness. A slot, 60-degrees in width shall be cut symmetrically about the vertical axis of each pipe, with the edges of the slot ground to be truly parallel to the longitudinal axis of the pipe. At regular intervals, 1-inch wide bands of the full pipe periphery shall be left in the pipe to act as stiffeners.

(b) Installation and Support: Skimmers shall be supported at each end so that a slight vertical or horizontal misalignment will not interfere with smooth operation. Each skimmer pipe shall be supported by and revolve in a rolled steel collar welded to an adjustable steel plate. Each open end support shall have segments welded to the internal periphery of the collar so as to provide ample bearing surface for the pipe without crushing the seal. Plywood fillers shall be furnished with the end supports to provide a watertight connection to tank walls without grouting.

(c) Operating Handles: Operating handles shall have a swivel-type connection and shall be attached permanently to the skimmer for operation of the skimmer from either direction.

(d) Seals: Seals of an approved type shall be installed between the skimmer pipe and the support collars. Seals shall be of material which is not affected by grease, by mild acids or alkalies, and shall be renewable without removing skimmer pipes from support collars.

10.20 Effluent Troughs: Effluent troughs for the primary tanks, and effluent troughs and sludge troughs for the final tanks shall be furnished and installed as shown on the drawings. Troughs may be furnished by the sludge collector manufacturer, or may be furnished under the specifications for miscellaneous metalwork.

10.21 Telescoping Valves: Furnish and install, as indicated on the drawings, telescoping valves, or slip pipes of the telescoping type, which shall consist of valve stand, "rising" or "non-rising" stem, 6-inch slip tube and a riser pipe section with seal for the slip pipe. Valve stand shall be equipped with 12-inch handwheel with crank grip and an accurate indicating device calibrated

to at least halves of an inch or 0.05 of a foot for 36-inches travel. Stems and nuts shall be brass; slip tubes shall be seamless, drawn brass tubing with cast or fabricated bronze bail. Riser pipe section for telescoping valves shall be furnished by pipe supplier and shall be unlined. Seal and necessary flanges or couplings shall be furnished by telescoping valve manufacturer. Telescoping valves shall be furnished by the sludge collector manufacturer, by the Chicago Pump Company or approved equal.

10.22 Rotary Distributor: Furnish and install two (2) Rotary Distributor mechanisms in the location indicated on the drawings. The distributor shall be of the mechanical seal type, for trickling filter beds 92 feet in diameter and shall be capable of distributing sewage uniformly over the beds at all rates from 1300 GPM to 3500 GPM at a maximum available head of 72 inches from the stone in the filter to the high water level in the center column. The machine shall pass flows 10% lower or higher than the above valves without appreciable variations in distribution of low flows or excessive head increase of higher flows.

(a) Manufacturer: The Bidder shall submit prices on equipment furnished by at least one manufacturer in each group A and B listed below. The grouping and listing of such names does not constitute nor infer preference. Use lowest price for base bid.

A: Dorr Oliver, Inc., Pacific Flush Tank Co.
B: American Well Works Co., Walker Process Co.

The bidder may submit an alternate bid on some other make of distributor based on the manufacturer's own specifications. An alternate bid on distributors, if included by the bidder shall be listed in the space provided under the heading "Alternate Equipment" in the proposal. Complete information on equipment listed for base bid and alternate equipment, if bid, shall be furnished in accordance with Par. 10.04(c) and Par. 10.22(j).

(b) Field Test: The distributor manufacturer shall conduct field tests in the presence of the Engineer to check the flow distribution of one or all distributors of each diameter furnished. The distribution will be tested at maximum flow, minimum flow and at some intermediate flow. Distribution pans measuring at least 36" x 36" x 10" deep shall be furnished by the Contractor and placed at various distances from the center of the filter in a radial line, using at least six pans for each test and repeating the tests at other distances for the same flows to the complete satisfaction of the Engineer. Tests should show less than 5% variation at any point on the outer 90% of the bed radius from the average, and less than 10% variation on the inner 10% of the bed radius. An appreciable variation from the test requirement will constitute cause for rejection of the distributor equipment. Tests shall not be conducted when wind velocity is 10 MPH or greater. The quantity of maximum and minimum flow handled by the distributors will also be tested for one or all distributors of each diameter furnished. Failure to meet the specified flows, after sufficient time has been allowed for necessary adjustments and retesting, will constitute cause for rejection of the distribution equipment. All alterations required to meet the required performance by the tested machine shall be done in the exact manner for the second distributor. The requirements of this paragraph shall apply to any make of equipment furnished under this contract.

(c) Distributor Mechanisms: Distributor mechanisms shall either be of the stationary support column type or the base bearing type furnished in accordance with the following specifications.

(d) Distributors; Stationary Support Column Type: The following specifications are for the furnishing of distributors of the stationary support column type:

1. Stationary Support Column: The rotary distributor shall consist of a fabricated steel center column and a steel base of ample footing area which is to be securely anchored to the concrete foundation by anchor bolts fitted with double nuts for leveling. The stationary base shall be designed with ample inlet ports to allow the sewage to flow into the distributor arms with a minimum of restriction and shall provide a 20-inch diameter supply inlet.

2. Rotating Assembly: Rotating manifold shall be of high grade cast iron, with fabricated steel manifold support or of cast steel. Connections shall be provided at the top of the rotating assembly for attaching the arm supports. These connections shall be so arranged that the entire top bearing assembly may be removed without detaching the guy rods supporting the arms.

3. Top Thrust Bearings: Top thrust bearings supporting the rotating assembly on the stationary column shall be of the spherical roller self-aligning type arranged for oil lubrication. The bearings shall be designed to support the vertical thrust loads of the machine full of water and to withstand any horizontal thrust due to eccentric loads on the arms. The bearing assembly shall be arranged so that vertical adjustment of the manifold may be made at any time, or provision for permanent leveling screws under the center column base shall be made to permit any necessary releveling of center column.

4. Stabilizing Lower Bearing: The stabilizing bearing shall be provided at a point above the manifold to positively maintain stability of the rotating assembly. This bearing shall be designed for the horizontal thrust due to eccentric loads on the arms and shall be suitable for either grease lubrication or sewage lubrication when submerged. Pressure grease fittings shall be provided.

5. Seal: The seal between the rotating and stationary elements shall be provided by a leather disc or spring loaded neoprene seal of an easily replaceable design which shall be adequate for any head which can be placed on the rotary distributor. The metal surface and sliding contact with the leather seal shall be of stainless steel.

(e) Distributors; Base Bearing Type: Distributors of the base bearing type shall be furnished in accordance with the following specifications:

1. Stationary Base: Stationary base or support shall be made of high test cast iron of ample footing area and shall be securely anchored to the concrete center pier by anchor bolts to assure rigidity; anchor bolts shall be fitted with double nuts for leveling. The base shall be designed to support the entire weight of the distributor and shall be designed with an inlet passage of minimum

300 square inches area to secure a low inlet velocity to the distributor and to allow the sewage to flow to the distributor arms with a minimum of restriction. The base shall provide a 20 inch diameter supply inlet. The base shall support the entire weight of the distributor equipment on two concentric ball races having diameters of at least 31-1/2 and 36 inches. The balls shall be 1-1/4 inch diameter, of high grade steel bearings properly spaced, running in an oil bath, and protected from dust and moisture by felt seals. The balls shall bear on renewable hardened steel strip liners inserted in the base and to readily determine its level.

2. Rotating Assembly: A revolving top assembly shall be constructed of high test cast iron and welded steel and shall be designed to revolve on ball races in the base. It shall have outlets for arm connections and attachments at the top for the arm supports. The top assembly shall be designed to allow equal distribution of the sewage to all four arms with a minimum of restriction.

3. Seal: A mechanical seal of the neoprene type shall be provided between the stationary base and the revolving top assembly suitably for a head of 7 feet of liquid in the center column assembly measured from the top of stone.

(f) Arm Supports, Arms, Spreader Jets and Appurtenances: The arm supports, arms spreader jets and appurtenances for both distributor mechanisms shall be in accordance with the following:

1. Arm Supports: The distributor arms shall be amply supported by galvanized steel rods connecting to the top of the rotating assembly. Horizontal galvanized steel rods with turnbuckles shall be provided between the arms to steady the arms and prevent buckling. Arm supports shall be properly attached to the arms and shall be provided with galvanized turnbuckles. The arm supports shall be so designed that they will support the pipe fully loaded, the weight of the supports themselves, and the weight of a man situated anywhere on the arms, Tensile stresses shall not exceed those recommended by the A.I.S.C.

2. Arms: Distributor arms shall be four in number as shown on the drawings; they shall be 10 inch diameter schedule 40 steel pipe with connections between length of pipe made by means of special flanges and gaskets. Fabricated arms of equivalent capacity and metal thickness as schedule 40 steel pipe, 10" diameter, will be acceptable. Flanges shall be faced after welding to arms; arm connections to the manifold shall be flanged. Arms shall be hot-dipped galvanized after fabrication. Provide 1-1/2 inch vents or larger at the end of each arm to prevent siphonage. Provide at least a 1/2 inch diameter drain at the low point in each arm. Equip each arm with a quick acting, full opening dump gate for flushing; provide means for maintaining gate in open or closed position with a lock or latch which can easily be operated by hand without the aid of tools. At the end of each arm provide a standard pipe tap with suitable galvanized fittings and nipples so as to direct a jet of sewage against the filter wall above the top of stone for normal ranges of flow.

3. Spreader Jets: Spreader jets shall consist of either fixed or adjustable orifices. For fixed orifices distributing arms shall be

drilled and tapped to receive the required number of spreader jets. These fixed spreader jets shall be the two-piece forged brass or Aluminum Alloy 214 type with instantaneously removable deflector or of the hinged deflector type fabricated from machine brass forgings or Aluminum Alloy 6061-T4. The fixed spreader jets shall be easily removable and consist of circular orifices with spray spreader plate designed to minimize cloging and facilitate cleaning, and shall be of such a number and so spaced on the arms to give uniform distribution over the entire area of the filter bed. All fixed type orifices shall be a minimum of 1/2" in diameter. If adjustable orifices are used, all the distributing arms shall be equipped with the proper number and size openings so spaced on the arms to give uniform distribution over the entire area of the filter bed. Each opening in the arms shall be equipped with an individual brass spreader. The spreader shall be designed so as to permit easy access to the openings for cleaning. Spreaders shall be secured to the arms by brass carriage bolts and gaskets shall be furnished for each spreader to prevent leakage around opening. In addition to spreaders, each opening shall also be equipped with two brass orifice plates so arranged that the flow from each orifice can be readily varied in the field.

(g) Shop and Field Painting: The complete center column or center rotating assembly of the rotary distributor shall receive one shop coat of Inertol No. 626 rust-inhibitive primer. All parts not readily accessible for field painting shall receive shop coat of Inertol standard thick black. Field painting shall be as specified under the Section "Painting" of these specifications.

(h) Shipping: The center column shall be shipped assembled as far as is possible. Parts shall be rigidly bolted to rugged shipping frames to prevent damage. Bearings shall be lubricated and crated where necessary for protection against damage.

(i) Field Erection: Distributing mechanisms shall be erected by the Contractor in strict accordance with the manufacturer's recommendations. Erection shall include furnishing the necessary oil and grease for initial operation. The grades of oil and grease shall be in accordance with the recommendations of the equipment manufacturer.

(j) Information Required: At least two weeks prior to the date of opening of bids, any manufacturer submitting bids to Contractors shall file with the Owner and the Engineer, the following information, by means of drawings and descriptions:

1. Installation: List of ten installations of equipment of the same design in successful operation, giving location, date of initial operation, capacity and conditions of operation.

2. Details: Details and construction of each machine showing:

   a. Seal Arrangement.
   b. Upper Bearing Arrangement, the size and type of bearing used.
   c. Lower Bearing Arrangement, the size and type of bearing used.
   d. Type, Number, Size of Spreader Jets, and full size sample.
   e. Means of Adjustment.

f. Large size details of center column, giving diameter and metal thickness, momement of inertia at sections between (a) arms and base, (b) through centerline of arms, and (c) typical section above arms, for stationary column and rotary column.
g. Thrust and guide bearing capacities and life expectancy, with authority.
h. Drawings showing arrangement and sizes of arms, trusses and ties.
i. Weight of complete machine when empty. These weights to be verified on the job.

3. Formal Approval: The following additional information shall be furnished for formal approval:

a. Weight of complete machine when full of liquid.
b. Moment at center of machine under maximum loading which distributor is designed, and basis for design.
c. Maximum unit stresses set up in section of distributor, also thickness of metal provided for each section.
d. Maximum velocity in pipe and net head available above center line of arms calculated at maximum, average and minimum of flow rates.
e. Minimum rate of flow necessary to start rotation and time required to reach maximum speed.

10.23 Digestion Equipment:

(a) Floating Cover: Two floating covers shall be provided to fit digestion tanks 80 feet in diameter. Unless deducted by the Owner, provision shall be made for each cover to be equipped with all appurtenances for future installation of a gas recirculation system as furnished by the cover manufacturer. The amount to be deducted for the elimination of this provision shall be listed under "Deductions" in the Proposal. The covers shall be designed to receive a roof deck and built-up roofing; they shall be made up of fabricated assemblies which shall be set up in the shop, match marked and knocked down for shipment. The covers shall be furnished complete with all specified appurtenances and shall be similar and equal to standard designs by the Pacific Flush Tank Company. Floating Covers shall be designed to produce a gas pressure of 5½ to 6 inches of Water beneath the cover without ballast and to permit if required [illegible] covers with ballast

Prices shall be submitted on covers manufactured by at least three of the following firms: Pacific Flush-Tank Co., Walker Process, Chicago Pump Co., Ralph B. Carter Company. Use lowest price in base bid. Information showing the sizes and thickness of all structural members and plates and a truss layout shall be filed with the Engineer as provided in Paragraph 10.04.

All structural steel used in the floating cover equipment shall be of the highest grade structural steel for bridges and shall have the following strength: "Ultimate strength of 60,000 to 72,000 lbs./sq.in., with a minimum yield point equal to one-half the ultimate strength but not less than 33,000 lbs./sq.in."

All plates and shapes shall be 1/4-inch minimum thickness.

All structural members shall be designed to allow the cover to be self-supporting when resting in an empty tank with the maximum possible loading as follows:

Dead load and roof load -------------------- 35 lbs./sq.ft.
Live, snow and vacuum load ----------------- 50 lbs./sq.ft.
Total --------------------------- 85 lbs./sq.ft.

The maximum allowable stresses under the above conditions of loading shall be as follows:

Tension --------------------------------- 20,000 lbs./sq.in.
Shear ----------------------------------- 13,000 lbs./sq.in.
Compression ----------------------------- 17,000 lbs./sq.in.
but not greater than $17{,}000 - 0.485\ l^2/r^2$

Fabricated assemblies to form the completed cover shall be shipped in as large sections as practical, and shall consist of rim plate assemblies, truss assemblies, gas dome assembly, ceiling plate sections, manhole assembly, roofing support purlins, and miscellaneous connection members and appurtenances.

There shall be provided in addition to the main assemblies, 8" drain sumps in the outer ceiling section with 3" access wells above, 24" entrance hatch and cover, 27" manhole, two 8" sampling wells with gas-tight quick-opening covers (one sampling well to stop at ceiling plate, one sampling well to extend to the bottom of rim plate), top rollers, bottom spring guides, 24" gas pipe and selector housing, combination pressure and vacuum relief manhole.

All welding, both shop and field, shall be shielded arc welding and shall conform to the latest standards of the American Welding Society for gas-tight welding.

Erection of the floating cover shall conform to instructions and drawings furnished by the manufacturer and to specifications given under Section No. 5 for erection, riveting and welding of structural steel. In no case shall welding be performed on surfaces which have been covered in error with a paint coating until such coating is entirely removed by sand blasting.

After all welding is completed the cover shall be tested for water tightness in the presence of the Engineer and the manufacturer's representative. An air test shall first be given and all leaks rewelded. The cover shall then be floated on water for 24 hours and rewelding done at all obvious leaks and damp spots. This shall be repeated until no damp spots appear at welded seams, as approved by the Engineer and the representative of the manufacturer.

Wood roof deck, roofing and flashing shall be installed, after testing and painting the cover, as specified in Section 9.02 and shown on the plans. If required by erection instructions, the Contractor shall pour and install suitable concrete blocks for weighting and balancing the cover against the gas pressure expected to develop.

(b) Supernatant Selector: A supernatant selector shall be furnished and installed in the digester according to manufacturer's directions. Selector shall consist of a 10-ft. length of 7-1/2" O.D. strainer of spirally wound construction with 0.125" slots, including plate cap and a 6" standard flanged tee base, or shall consist of a 10-ft. length of 8-inch O.D. strainer of vertical 1/4-inch diameter, Everdur bronze rods with

0.125" clear openings, including plate cap and 6-inch flanged Tee base. Construction shall be such as to permit removing selector section from digester without emptying the tank or removing gas pipe housing. Overall length from center of 6" discharge to extreme top of assembly shall be 12'-0". Selectors shall be similar and equal to units manufactured by the Pacific Flush-Tank Company, or the Walker Process Company. Alternate makes of similar design will be considered.

(c) Gauge, Sight Glass and Sampler: Gauge, sight glass and sampler for each digester shall be furnished and installed as shown on the drawings, complete with 3" valved inlet, sampling cock and basin with shut-off cock, and back flusing connection for supernatant selector as shown. Discharge connections with valves and support as required shall be as shown on the drawings. The gauge shall have a capacity range of 10 G.P.M. to 50 G.P.M. Equipment shall be similar and equal to units manufactured by the Pacific Flush-Tank Company, or Walker Process Company. Alternate makes of similar design will be considered.

(d) Digester Gauge Board: Furnish and install a gauge board which will indicate the liquid level in each digester below the over flow. The gauge shall be fabricated of 3/16" minimum thickness steel plates and structural shapes with stainless steel scale. Provide enameled weighted target or level indicator, counterweight, pulley, 1/8-inch stainless steel cable, weatherproof conduit and pulley frame. Pulley frame shall be supported by 2-1/2 inch galvanized or aluminum pipe set in pipe sleeve in top of concrete digester wall at suitable height to clear highest position of floating cover. The gauge board shall be equal to those of Pacific Flush-Tank Company, or Walker Process Company. Alternate makes of similar design will be considered.

10.24 Digester Heaters: There shall be supplied and installed two digester heaters and heat exchanger units having a sludge capacity of 370,000 B.T.U. per hour, and arranged for heating of the digester contents by means of recirculating digester liquor through the unit and for heating of the raw sludge before it enters the digester system, or for the heating of a mixture of the two. Each unit shall conform to ASME code regulations and shall carry a National Board Stamp of approval.

The fuel burning equipment shall include a combination gas and oil burner provided with oil pump and necessary accessories and controls for automatic burning of either sewage sludge gas or No. 2 fuel oil. It shall be fitted with screwed connections for connecting gas and oil supply lines at the heater. The burner shall burn gas only so long as sufficient gas is available to maintain the desired heater output or to satisfy heating requirements. At times of insufficient gas supply, the burner shall automatically change over to burning oil, maintaining an intermittent gas and oil burning cycle so as to automatically utilize all available gas. The burner shall be readily removable for maintenance.

Sludge heating capacity shall be based on heating sludge recirculated from a digester operating at 95° F., with the average temperature in the water bath not exceeing 145° F. In addition to sludge heating, each unit must be capable of simultaneously providing 185,000 BTU per hour for hot water building radiation. The total output capacity of the boiler portion of the unit shall be not less than 550,000 BTU per hour. The unit shall be self-contained and of the general design and dimensions shown on the plans, and shall be constructed of steel plate with minimum thickness of 5/8-inch for the ends and 1/4-inch for the shell, (where a separate boiler unit is used, the boiler tube sheets shall have a minimum thickness of 3/8-inches), with adequate stiffeners provided throughout to withstand a working pressure of 30 lbs. per sq. inch.

A structural base attached to the unit shall be provided to support and distribute the operating weight of the unit. The complete units shall be as manufactured by the Pacific Flush-Tank Company, the Walker Process Company, or other make conforming to these specifications. Submit complete data in accordance with paragraph 10.04.

Bid prices for digester heaters as manufactured by Pacific Flush-Tank Company and Walker Process, shall be required in the proposal. One other make may also be submitted subject to these specifications. Use lowest price in base bid.

The sludge tubes for conducting the material to be heated shall be standard weight steel pipe held firmly in position by multiple gasket joints so arranged that any leakage from sludge tubes or water bath will be exposed to atmospheric pressure and detected by telltale holes in the gasket rings, positively preventing contamination of the water bath by any material circulated through the sludge tubes. Return bends shall be completely removable for inspection or cleaning of the sludge tubes without draining the water bath. All passageways through the sludge tubes and return bends through which sludge is pumped must be large enough to pass a 2-1/2 inch sphere. The exterior heated surface of the sludge tubes shall have adequate area to provide the required tube surface for sufficient heat exchange to maintain satisfactory performance in normal operation, with reasonable service time between cleanings. Standard 4-inch flanged inlet and outlet connections shall be provided.

All surfaces exposed to fire shall be water cooled and shall be readily accessible for inspection and maintenance. The furnace tube shall be of standard weight steel pipe welded in place between the tube sheets. The removable back, forming an extension of the combustion chamber and a connection with the fire tubes, shall be of double walled construction and water cooled. It shall be readily removable for access to the fire tubes and furnace tube. Fire tubes for conducting hot gases from the combustion chamber of the exhaust breeching shall be standard steel boiler tubes, expanded securely in place and the ends beaded. The exhaust breeching shall be readily removable for access for fire tube cleaning.

All exterior surfaces except the front end and bottom shall be insulated with a minimum of 1-1/2 inch of insulating material protected by a sheet metal cover. The rear insulating cover shall be removable as a unit to provide access to the return bends and water back. All exterior metal surfaces of the unit shall be painted with a rust inhibiting paint before the insulation is installed. The entire unit, after insulation is installed, shall be painted with gray enamel, except the panelboard and electrical controls, which shall be painted black.

Positive control of the air for combustion and for the exhausting of products of combustion shall be provided as a part of the unit and shall consist of an exhaust fan driven by a standard induction type motor. Fan and motor shall be of a capacity in excess of maximum air requirements for combustion. Forced draft burners will also be acceptable.

Complete and positive safety control of fuel supply shall be provided by equipment approved by Underwriters' Laboratories and Factory Mutual Laboratories operating on the flame rectification principle with electronic detection. Flame failure shall automatically cut off fuel supply and such failure shall be indicated by sounding of the alarm horn. Control of main fuel supply and gas pilot shall be by means of motorized valves. Automatic spark ignition for fuel, and automatic restarting after a power failure or momentary interruption of a fuel

supply shall be provided.

The equipment shall include an expansion tank of sufficient capacity to provide for expansion of the water in the heater, heat exchanger and building radiation system, and shall include a water level gauge, overflow drain and vent. Also provide a water control unit, Mueller Company, H-9030, H-9000 and H-9045 or equal, consisting of strainer, reducing and relief valves, which will permit operation of the boiler as a closed system. Connections shall be provided for make-up water and drainage in addition to connections for circulation of the water bath through radiation units for building heating. A pressure relief valve and a limit thermostat shall be provided on the water bath of the unit. Indicating thermometers shall be provided at the inlet and outlet of the sludge tubes and on the water bath of the unit.

An electrical control panel shall be provided as a part of the heater on which shall be mounted a fused disconnect switch for the main power supply, two combination magnetic starters with overload protection for the control of the digester circulation pumps, exhaust fan starter, burner and safety control devices, alarm horn, ignition transformer and all electrical controls as hereinafter outlined. All electrical controls shall be in NEMA type 1 standard general purpose enclosures, and all exterior wiring shall be enclosed in conduit. Provide two extra, normally open, interlocks in each recirculation pump starter for control circuit to water seal unit starter and to individual solenoid valves for each pump. Provide control switch for operation of either or both circulation pumps.

The heater and heat exchanger unit shall be provided with accessory group controls in which the following features are available:

(a) Automatic control of the digester temperature (within 1/2° F. plus or minus) shall be provided by means of a close differential extra-sensitive thermostat with the thermostatic bulb located at the inlet to the sludge tubes of the unit. Selector switches shall be provided to allow either automatic or manual control of the digester temperature.

(b) A water recirculating pump shall be provided mounted on the unit for the circulation of hot water from the firing side of the water bath to sludge tube side. Operation of this pump, as well as operation of the burner equipment shall be automatically controlled by the temperature of the recirculating digester contents or raw sludge passing the thermostatic bulb, with auxiliary controls preventing the burning of fuel if the temperature of the water bath exceeds the setting on an adjustable limit thermostat, or if the digester circulation pump is stopped.

(c) A repeating cycle time switch shall be provided for periodic starting of the digester circulation pump with controls so arranged that the circulation pump will continue in operation until the digester heating requirements are satisfied, or shall stop a short period after a starting cycle in case heat is not required by the digester.

(d) Controls shall also provide for the digester circulation pump to run after digester heating requirements are satisfied until the sludge tube inside of the water bath has dropped to a predetermined low temperature setting, and to temporarily resume operation if the temperature of the sludge type portion of the water bath rises any appreciable amount. Terminal blocks for an electrical interlock shall be provided for connecting to the magnetic starter of the raw sludge pump to insure the

operation of the digester circulation pump when raw sludge is pumped.

(e) Nine tagged outlets shall be provided for connecting to (a) the main power supply 3 phase, 60 cycle, 440 volt AC, to (b) the motors of the digester recirculation pumps to (c) the control circuit supply single phase, 60 cycle, 115 volts AC to (d) the line voltage building thermostat and to (e) the extra contacts on the magnetic starters for the raw sludge pumps to (f) control circuit to starter for water seal unit, and to (g) control circuits to the 1/2" water seal solenoid valves.

(f) Heat for building radiation shall be obtained by hot water circulated from the firing side of the water bath by means of a hot water circulation pump in addition to the pump which supplies the hot water circulation to the sludge tube side of the water bath.

(g) Circulation in the building radiation system shall be controlled by an indoor thermostat. A water bath thermostat shall control the burning of fuel when the digester does not require heat. The water circulating pump shall be rated 12 G.P.M. at 20 feet total head. Motor shall not overload at any lower head.

(h) A thermal circulation valve shall be provided at the upper portion of the baffle inside the heater unit which can be opened to permit thermal circulation to the sludge tube side of the heater, thus not requiring operation of the water circulating pump during seasons of the year when building heat is not required, but maintaining either automatic or manual control of the digester temperature.

10.25 Gas and Miscellaneous: The following equipment shall be furnished and installed:

(a) Combination Pressure Relief Waste Gas Flame Trap: Furnish and install one cast iron combination pressure relief waste gas flame trap equipped with six-inch inlet and outlet connections.

Relief valve shall be actuated by means of a properly protected diaphragm of the adjustable weighted type to allow sensitive control of the gas pressure. The flame trap element shall be of a replaceable nature and consist of coiled metal forming a series of ducts such that flame will not pass through them, but numerous enough to pass at least 9,000 cu.ft. of gas per hour at a pressure loss not to exceed 1/2 inch. Each unit shall contain, in addition, a spring actuated valve held open by a fusible plug as a further protection against burning mixtures.

Combination pressure relief waste gas flame trap unit shall be similar and equal to Model No. 94 as manufactured by the Pacific Flush-Tank Company, or Varec of equal capacity.

(b) Waste Gas Burner: Furnish and install one 4-inch pedestal type waste gas burner having 6-inch connection for the burner and one-inch connection for the pilot.

Complete burner shall include the flange base and anchor bolts for installation on concrete foundation, with support pedestal six feet high of cast iron filled with suitable insulating material, burner pot, pilot sight glass, pilot orifics and ignition ring. The burner shall be capable of passing 9,000 cu.ft. of gas per hour at a pressure loss not to

exceed 1/2-inch of water. The unit shall be similar and equal to Model No. 1348 as manufactured by the Pacific Flush-Tank Company, or Varec of equal capacity.

(c) Drip Traps: Furnish and install drip traps where shown on the plans, and at all other low points of gas service lines in building, each trap consisting of a reservoir casting and gasketed cover with rotary valve. Unit shall be equipped with 1" pipe thread arranged to connect to vertical pipe nipple screwed into fitting in low point of gas line. Drip traps shall be of manually operated type so arranged that when connection to gas line is open, drain opening is automatically closed, and vice versa. Unit shall be similar and equal to No. 466 units manufactured by the Pacific Flush-Tank Company, or Varec, and of required capacities indicated on plans.

(d) Gas Meters: Gas meters shall be furnished as specified under Section No. 13.

(e) Furnish and install 2 - 4" low pressure gas check valves, P.F.T., Model 420, flanged, cast iron; or Varec equal.

(f) Furnish and install 2 - (two) condensate accumulators, P.F.T., Model 1022, flanged, cast iron; or Varec equal.

(g) Flame Traps: Furnish and install for each of the digester heaters one cast iron flame trap assembly equipped with 2-inch inlet and outlet connections similar and equal to Model No. 91 as manufactured by the Pacific Flush-Tank Company or Varec of equal capacity. Flame trap element shall be of a replaceable nature and consist of coiled metal forming a series of ducts such that the flame will not pass through them but numerous enough to pass at least 1500 cu.ft. of gas per hour at a pressure loss not to exceed 1/2-inch. The unit shall contain, in addition a spring actuated valve held open by a fusible plug as a further protection against burning mixtures.

Furnish and install in the gas burner pilot line and other gas service lines, one-inch auxiliary flame cells consisting of coiled metal strips spaced to prevent passage of flames, but without thermal cut-off. Install the flame cell in a vertical gas riser as shown on the plans. Flame cells shall be Model No. 226, Pacific Flush-Tank Company or Varec of equal capacity.

(h) Gas Pressure Indicating Gauges: Furnish and install for the gas piping from the digesters 4 (four) oil actuated gas pressure indicating gauges suitable for wall mounting and capable of accurately measuring gas pressure from 0 to 10 inches of water, Pacific Flush Tank Model No. 790, or Varec of equal capacity.

The units shall be mounted as shown and shall consist of individual oil reservoirs provided with drain plugs, glass riser tubes and scales properly calibrated to read pressures directly in inches of water when using a common light grade oil, and 3/8" O.D. copper tubing pressure connections equipped with special valves to permit checking gauges. The scales shall be titled: Digester, Service, Waste.

(i) Digester Thermometer: Furnish and install in each digester a mercury actuated dial indicating thermometer, Taylor Instrument Co., #61KM type, or approved equal, with the following features:

Case: 6-inch, black, bottom connected with dial range of 0° to 110° F., using working temperature 55° to 95° F.

Capillary: Stainless steel tubing, alloy filler wire and mercury, temporary compensated to indicate essentially true bulb temperature.

Bulb and Stem: Stainless steel, to fit accurately in stainless separable well 3 ft. long from bottom of 1-1/4" N.P.T. to end of well; well to be mounted in pipe sleeve with 1-1/4" threaded bushing in concrete wall.

10.26 Laboratory Equipment: Furnish and install the following laboratory equipment and supplies. All items listed shall be procured from a recognized dealer of scientific products with a national standing, such as A. H. Thomas, Fisher Scientific, Central Scientific, or Southern Scientific. The Contractor shall furnish in triplicate for approval quotations listing each item with catalog numbers, size and quoted price. Catalog numbers are for identification as to type and quality.

LABORATORY EQUIPMENT - LIST NO. ONE

		Catalogue Numbers		
Quantity	Description	A.H.Thomas Co.	Fisher Co.	Southern Scientific
	SETTLEABLE SOLIDS			
4	Imhoff Cones	4043-A	15-440	28691
1	Brush	2367-A	3-562	28721
1	Imhoff Cone Support - wooden, 3 place	4043-D	15-443	28711
	TOTAL SOLIDS			
6	Evaporating Dishes - Coors Porcelain #2	4480	8-690	11076
1	Analytical Balance - (Notched Beam, chainweight) Wm. Ainsworth & Sons - Type LCB	1852	1-933	2963
1 Set	Weights (1 gm. - 50 gm.) - (Chromium plated, Class S-2)	1986-B	2-224	3866
1	Brush, 1/2 in.	2375	3-665	6896
2	Pipettes, Transfer - 50 Ml.	8150	13-649	21751
2	Flasks, Volumetric - 100 Ml.	5460	10-199	13891
1	Drying Oven, Thelco, 10 x 10 x 12	7831	13-256-B	20842
1	Thermometer - (-10° to 150° C.)	9525	14-985	26801
	SUSPENDED SOLIDS			
1	Filter Pump - 3/8" - (Large)	5286	9-956	13301
1	Filter Pump Coupling - 3/8" thread	5288	9-975C	13336
4	Filter Flasks, Pyrex - 500 Ml.	5431	10-180	13791
2	Brushes, Swivel Joint	2370	3-565	6746
1	Brush	2561	3-560	6841
10	Gooch Crucibles, Coors Porcelain - Size 3 - 25 Ml.	4135	8-195	10266
1 Lb.	Asbestos - Special for Gooch Crucibles	Uloav	1-458G	

		Catalogue Numbers		
Quantity	Description	A.H.Thomas Co.	Fisher Co.	Southern Scientific
	SUSPENDED SOLIDS (Cont'd)			
2	Dessicators - 150 mm. diameter	4435	8-595	10736
2	Dessicator Plates - 140 mm.	4454	8-635	10851
2	Crucible Holders - Walter's	4200	8-285	10361
2 Lb.	Calcium Chloride - Technical - for Dessicator	Uwayb	C-72	
1 Pr.	Crucible Tongs	9889-A	15-193	27346
5 Ft.	Rubber Tubing, Heavy Wall - 3/8" or to fit pumps	8844	14-175	23486
2	Cylinders, Graduated - 100 Ml.	4408	8-549	10696
	VOLATILE SOLIDS			
1	Muffle Furnace, FD202	5732	10-511-B	
10 Ft.	Rubber Tubing - 5/16" bore	8831	14-160	23466
4	Triangles - 2" side	9722	15-255	27516
1	Support with Rings - Large	9342	14-680	25866
6	Wire gauze squares 5" x 5"	5995	15-990	28946
1	Rheostat for Muffle Furnace	5735	10-513-B	
	pH			
1	La Motte sludge pH outfit (Phipps and Bird catalog #43-940)			
500 Ml.	La Motte Standard Indicator Solution, Chlorphenol Red	Vaujs	5-985J	16666-8
500 Ml.	La Motte Standard Indicator Solution, Brom thymol blue	Usaqn	5-985L	16666-9
500 Ml.	La Motte Standard Indicator Solution, Phenol Red	Yfcap	5-985M	16666-10
6	Color Comparison Tubes	3799	11-507-61	
4	Indicator Droppers	3798		
4	Bottles, Pyrex, 60 Ml.	2233		
	TURBIDITY			
1	Jackson Turbidimeter	9770	15-380	28811
1	Turbidimeter Tube - 75 Cm.	9772-B	15-390	28814
12	Standard Candles	9774	4-669	28816
	BIO-CHEMICAL OXYGEN DEMAND			
1	20° C. Incubator - 110 volts	1470-A	11-678-1	17051
1	Thermometer - (-10° to 150° C.)	9525	14-985	26801
1	Still, Stokes Electric - 1/2 Gal./Hr., 230 volt		9-061	
2	Bottles - 5 Gal.	2210-A	2-887	5841
72	Incubation Bottles (BOD - 300 Ml.)	2337-H	2-926	28621
2	Bottles, Pyrex - 1000 Ml.	2233	2-886	5821
10	Bottles, Pyrex - 500 Ml.	2233	2-886	5821
1/2#	Rubber Stoppers #4	8810	14-130	23390
1/2#	Rubber Stoppers #6	8810	14-130	23390
1	Cylinder, Graduated - 1000 Ml.	4408	8-550	10636
2	Flasks, Volumetric - 200 Ml.	5460	10-199	13891
2	Flasks, Volumetric - 500 Ml.	5460	10-199	13891
2	Flasks, Volumetric - 1000 Ml.	5460	10-199	13891
10	Flasks, Erlenmeyer - Pyrex - 300 Ml.	5342	10-040	13676

		Catalogue Numbers		
Quantity	Description	A.H.Thomas Co.	Fisher Co.	Southern Scientific
	BIO-CHEMICAL OXYGEN DEMAND (Cont'd)			
6	Pipettes, 1 Ml. in 1/10 Ml.	8164	13-664	21791
3	Pipettes, Mohr - 10 Ml. in 1/10 Ml.	8164	13-664	21791
2	Burettes - 50 Ml. in 1/10 Ml.	2443	3-699	6951
1	Burette Stand - Double, Fisher	2519	14-688	25976
1 Lb.	Glass Tubing - 9 mm. outside diameter	6080	11-350	15621
25 Ft.	Rubber Tubing - 5/16 in.	8831	14-160	23461
4	Pinchcocks - Large Size	3278	5-850	8761
2	Spatulas - 5" Blade	9000	14-365	23996
12	Stirring rods - 3/16" x 8"	6067	11-380	15711
1	Armored Thermometer (-20° to 107°)	9554	15-025	
2	Funnels, 75 mm. diam. - Pyrex	5574F	10-326F	14176
2 Pkg.	Filter Paper, Whatman No. 1, 150 mm. diam.	5200	9-805	13106
6	Beakers, Pyrex, 250 Ml.	2110	2-540	4191
6	Beakers, Pyrex, 600 Ml.	2110	2-540	4191
9 Lb.	Sulfuric Acid - C.P.	Tzazi	A-300	
1/4 Lb.	Potassium Permanganate - C. P.	Yjque	P-279	
1/4 Lb.	Potassium Oxalate - C. P.	Yjjox	P-273	
1 Lb.	Potassium Dichromate - C. P.	Ygydl	P-188	
1 Lb.	Manganous Sulfate - C. P.	Yalbo	M-112	
2 Lb.	Sodium Hydroxide - C. P.	Ypevb	S-318	
1 Lb.	Potassium Iodide - C. P. - Low in Iodates	Yiybl	P-256	
1/4 Lb.	Sodium Thiosulfate - C. P.	Yslne	S-445	
1 Lb.	Sodium Bicarbonate - C. P.	Ymyex	S-233	
1 Lb.	Starch, Soluble, Lintner	Yupui	S-517	
1 Lb.	Potassium Phosphate, Monobasic, C.P.	Yjzuv	P-285	
1 Lb.	Magnesium Sulfate - C. P.	Xytci	M-63	
1/4 Lb.	Sodium Azide - C. P.		S-227	
1/4 Lb.	Ferric Chloride - C. P.	Wykkc	I-88	
1/4 Lb.	Calcium Chloride (anbyd.) - C. P.	Uwqbu	C-74	
1/4 Lb.	Ammonium Sulfate - C. P.	Viwoq	A-702	
1/4 Lb.	Sodium Acid Sulfate	Ynlys	S-244	
1/4 Lb.	Salicylic Acid - C. P.	Tykza	A-277	

Note: Chemicals listed are to be Bakers analyzed or equal unless otherwise specified. A. H. Thomas chemicals have no catalog numbers, hence code words are used for identification.

Quantity	Description	A.H.Thomas Co.	Fisher Co.	Southern Scientific
1	Refrigerator, Sealed Mechanism, 8 cu.ft., standard make			
1	Support, Draining Rack	9513	14-782	26006
1	Illuminator, Fluorescent for titrating, 110 volts	6323	11-991-5	
	RELATIVE STABILITY			
2 Ft.	Rubber Tubing, Gooch - 1-1/4 in. flat	8846	14-180	23511
2	Pipettes - 1 Ml. in 1/10 Ml.	8164	13-664	21791
1/4 Lb.	Methylene Blue	Yenbi	NA652	SOMBO

Quantity	Description	Catalogue Numbers A.H.Thomas Co.	Fisher Co.	Southern Scientific
	MISCELLANEOUS			
1	"Standard Methods for the Examination of Water and Sewage", latest edition by American Public Health Association, 1790 Broadway, New York 19, New York			

10.27 Payment: No separate payment will be made for work under this section of specifications. The cost of the work and all costs incidental thereto shall be included in the item to which the work pertains.

Quantity	Description	Catalogue Numbers A.H.Thomas Co.	Fisher Co.	Southern Scientific
	MISCELLANEOUS			
1	"Standard Methods for the Examination of Water and Sewage", latest edition by American Public Health Association, 1790 Broadway, New York 19, New York			

10.27 Payment: No separate payment will be made for work under this section of specifications. The cost of the work and all costs incidental thereto shall be included in the item to which the work pertains.

DIVISION ONE

SECTION NO. 11

CENTRIFUGAL SEWAGE PUMPS, SUMP PUMPS WATER SEAL PUMPS AND SLUDGE PUMPS

11.01 Scope: The work covered by this section of specifications consists of furnishing all materials and equipment, and performing all labor necessary for the complete installation of all pumping equipment, and appurtenances thereto, as indicated on the drawings, and/or as specified.

11.02 Work Under Other Sections of Specifications: The Contractors attention is directed to Section No. 10 of these specifications, entitled "Mechanical Equipment." All conditions and requirements of said Section No. 10 which may affect work under this section of specifications are made a part hereof as though fully contained herein. The Contractors attention is further directed to Section No. 1 of these specifications with reference to requirements for furnishing working drawings. The manufacturer shall furnish six (6) sets of guaranteed performance curves for each centrifugal sewage and sludge pump in accordance with Section No. 10 and six (6) sets of certified test curves for each pump prior to shipment.

11.03 Service: Service for equipment installed under this section of specifications shall be in accordance with the requirements of the Paragraph entitled "Service" of Section 10. The estimated number of days service to be furnished during initial installation and operation of equipment are as follows:

Paragraph	Equipment	Service
11.04	Centrifugal Sewage Pumps	4
11.07	Sump Pumps	0
11.08	Water Seal Pumps	1
11.09	Sludge Pumps	1

In addition to service specified, the representative of the manufacturer shall instruct the Owner's personnel in the care and maintenance of equipment furnished.

11.04 Centrifugal Sewage Pumps: Centrifugal sewage pumps shall be heavy duty, non-clog, with impellers of centrifugal type as defined in the "Standards of the Hydraulic Institute" or may be "bladeless" type as approved by the Engineer. The pump prices used by the bidder in the base bid shall be based on pumps furnished by Chicago Pump Company, American Well Works Company, Fairbanks, Morse and Company, or Allis Chalmers Co., subject to compliance by said manufacturers with pump specifications herein. At least three of the above named manufacturers will be listed in the proposal. Use lowest price in base bid. The bidder may submit an alternate bid on another make of pumping equipment complying with these specifications; said alternate bid, shall be included in the spaces provided under the heading "Alternate Equipment" in the proposal. The head, capacity and other requirements for raw sewage pumps and sludge circulation pumps shall be in accordance with the following requirements:

Raw Sewage and Sludge Circulation Pumps

	Raw Sewage Pumps	Sludge Circulation Pumps
Number Required	6	4
Capacity GPM	2000, 2500, 3000	150
Head at Capacity, ft.	54 48 41	48
Minimum Head, ft.	30	20
Shut-Off Head, above, ft.	78	55
Size Suction*	10"	4"
Size Discharge*	8"	4"
Minimum Motor H.P.	40	5
Maximum RPM	870	1150

*Pump head must be increased for smaller suction or discharge.

Pump heads lower than shut-off head specified above shall be considerably in excess of design heads and subject to approval. In special cases pumps of lower efficiency and larger horsepower than given in the above table may be approved by the Engineer, in which event the Contractor shall furnish and install all necessary increased wiring, starters, branch and main breakers and/or other necessary appurtenances at no additional cost to the Owner. Horsepower required by each pump between maximum and minimum head shall not exceed the standard rating of the motor by more than 15%.

11.05 Raw Sewage Pumps: Raw sewage pumps shall conform to the conditions specified above and shall be furnished in accordance with the following requirements:

(a) Mounting: Pump case shall be mounted directly on a pedestal base with built-in suction elbow. A bearing bracket containing radial and thrust ball bearings for supporting the pump shaft shall be bolted on the pump casing. Both casing and housing shall have machined, tongue and groove surfaces which will insure constant alignment.

(b) Case: The case shall be cast iron, smoothly finished. A hand hole of ample size shall be provided in the pump discharge. The cover shall be so constructed that it will properly fit the curvature of the casing and provide a streamline form to prevent materials being caught on projections in the line of flow. A similar hand hole shall be provided for the suction elbow.

(c) Impeller: The impeller shall be cast iron, non-clog, either open type or enclosed type with shroud plates on both sides of the vanes, at least two waterways and so designed as to pass any solids entering the suction.

(d) Shafts: Shafts shall be of sufficient diameter to carry the maximum load without deflection and shall have renewable stainless steel sleeves and seal ring to prevent leakage at the packing gland. Pump impellers shall be locked and keyed to shafts.

(e) Bearings: The bearing housing shall be close grained cast iron or semi-steel. Provide two sets of ball bearings located wide apart to insure smooth, vibrationless operation. Bearing mounting shall permit free thermal expansion or contraction of the shaft without binding the

bearing. Provide bayonet type grease pressure fittings and a 2-lb. capacity grease compressor for each building in which pumps are installed.

(f) Packing Glands: Pump packing glands shall be bronze, split type, with ample clearance provided for packing. Packing glands shall be suitable for water seal. Method of water seal shall be as further specified in these specifications.

(g) Motor Mounting and Connection: Sewage pumps shall have the motors mounted on separate base plates furnished by manufacturer. Motor and pump shall be connected with universal type flexible shafting so designed to compensate for misalignment and to eliminate vibration and bearing strain. The shaft connections to the pumps shall be provided with a removable guard designed to meet safety requirements and regulations governing industrial installations of this type. The guard shall be either "split-case" or with hinged door for easy access to shaft grease fitting. Intermediate steady bearings, if required, shall be spaced and properly supported as indicated on the drawings, or as required by the pump manufacturer. Drip piping 3/4" in size shall be provided for all pumps, using crosses and plugs, at all bends. Piping shall be run to nearest drain in a manner so as not to constitute a hazard to foot traffic.

(h) Motors: The motors shall be vertical solid shaft normal starting torque, squirrel cage induction motors rated 40 H.P. continuous, 440 volts, 3 phase, 60 cycles, 40 degrees C., 1.15 service factor, with thrust and guide bearings adequate to the specified service and the pump they will drive. They shall be in accordance with current NEMA, AIEE and ASA standards, free from defective material and workmanship and of General Electric or Westinghouse manufacture or an approved equal.

Motor frames and end shields shall be of cast iron or heavy fabricated steel of such design and proportions as to hold all motor components rigidly in proper position. Where oil lubricated bearings are used, the sight gauges shall be so located and designed as to be easily readable.

The winding insulating materials shall include a synthetic varnish film over the conductor and an overall silicone compound to provide moisture proof characteristics over an extreme range in temperatures without cracking and good heat transfer characteristics. The windings shall be bonded resiliently to the laminations by this compound, which will permeate the end turns and slots to seal the windings against extreme moisture, dust and corrosion.

(i) Control System: The control system for raw sewage pumps shall be of the "Autocon Bubbltrol" type as specified under the section "Pump Control Equipment". Other electrical work and equipment shall be as indicated on the drawings and/or specified under the section "Electrical Work" of these specifications, and as required for proper operation of equipment furnished.

11.06 Sludge Circulation Pumps: Sludge circulation pumps for installation in the Digester Head House shall conform to the head, discharge and other conditions specified under the paragraph "Centrifugal Sewage Pumps" above, such pumps shall be furnished as specified under the paragraph "Raw Sewage Pumps"

above, except that pump motors shall be mounted on a pedestal built around the pump bearing housing and supported directly on the pump casing. Motors shall be 440 volt, 60 cycle, 3 phase. The casing shall be suitably reinforced to take the weight of pedestal and motor. A flexible coupling shall be provided between pump and motor shafts. Seal water shall be provided as further specified under this section of Specifications. Control, starting equipment and other electrical work shall be furnished and installed as indicated on the drawings and as specified under the section "Electrical Work" of these specifications.

11.07 Sump Pumps: Vertical motor driven sump pumps shall be installed in the dry well of the raw sewage pump station and in the digester head house, as shown on the drawings. Sump pump motors shall be single phase, 1750 RPM, equipped with automatic float controls. The sump pumps to be installed in the raw sewage pump station and in the heater section of the digester head house shall be equipped with standard drip-proof motors. The sump pump to be installed in the valve house section shall be explosion proof. Suitable sump covers shall be furnished for mounting over a 24-inch diameter sump in the pump station, and 18-inch sumps in the digester head house. The capacity and head of vertical motor driven sump pumps shall be in accordance with the following:

One - Sump Pump - (Pump Station):	20 GPM at 37 ft. TDH. 3/4H.P.,220V.
One - Sump Pump - (Heater Section):	10 GPM at 22 ft. TDH. 1/4H.P.,110V.
One - Sump Pump - (Valve Section):	10 GPM at 22 ft. TDH. 1/4H.P.,110V.

Electrical work for installation of sump pumps shall be as indicated on the drawings and as specified under the Section "Electrical Work" of these Specifications.

11.08 Water Seal Pumps and Systems: Furnish and install five (5) water seal pumping systems and controls, as indicated on the drawings, for the following use.

Three-Water Seal Systems: For furnishing seal water to six (6) raw sewage pumps. One (1) system for each two pumps. (Located in raw sewage pump station)
One-Water Seal System: For furnishing purge water to recirculation metering device. (Located in raw sewage pump station.)
One-Water Seal System: For furnishing seal water to four (4) digester circulation pumps. (Located in the digester head house.)
One-Water Seal Pump: For spare to be placed in storage as directed.

Unless otherwise approved, water seal pumps shall be furnished by the manufacturer of the centrifugal pumps furnished under this contract.

(a) Water Seal Pumps: Provide water seal pumps as follows:

Six - Close coupled centrifugal pumps, mechanical seal, non-overloading impeller, or turbine type with relief valve and bypass, 1750 RPM ball-bearing drip-proof motor with sufficient power for service required without overload; 5 GPM capacity (or more if required) at 5 psi higher pressure than highest pressure of unit served.

(b) Water Seal Piping Systems: Piping from seal water pump discharge to each unit shall be hard drawn copper as specified under the Section "Metal Pipe, Fittings, Valves and Gates" of these specifications.

Install for each sewage pump, in a location convenient to the pump, a visible flow type regulator calibrated from 0 to 5 GPM. Provide 10 solenoid valves, ASCO 8210A 1/2-inch, with stainless steel core, to supply seal water to each raw sewage or sludge circulation pump when pump is operating, and a by-pass with solid wedge gate valve around each solenoid valve. Stainless steel strainers and solid wedge gate valves shall be installed in piping ahead of each solenoid valve. Solenoid valves shall be 110 volt, suitable for at least 30 psi working pressure.

Solid wedge gate valves and visible flow type regulators shall be installed for purge water supply to each of the two recirculation flow meter connections. See Section 13:07.

(c) Electrical Work: Water seal pump motors and solenoid valves on seal water piping to pump seals shall be actuated by extra interlocks to be provided in raw sewage and sludge circulation pump motor starters.

All motors shall be for 440 volt, 3 phase, 60 cycle operation, horizontal, drip-proof, with moisture sealed insulation, 40° rise NEMA standard.

(d) Water Seal Supply: Furnish and install the following equipment:

Two - Water Seal Tanks, 14 gauge galvanized iron, approximate capacity 45 gallons, to be mounted as shown on plans, and equipped with water supply, drain and overflow connections.

Two - Visible probe control systems - "Autocon" as manufactured by the Automatic Control Company, installed on each receiver, for maintaining water level in the receivers by control of the solenoid valves specified below.

One - Solenoid valve ASCO No. 8210A, 1-inch packless, with full pipe area, with stainless steel core, for 125 psi working pressure, normally closed, for 110 volt operation. Stainless steel strainer and solid wedge gate valve shall be installed in piping ea. side of solenoid valve. A 1-inch by-pass with solid wedge gate valve to be provided around solenoid valve, to be installed in 1-1/2" feed line to water tank in Pumping Station.

One - Solenoid valve ASCO No. 8210A, 3/4-inch packless, with full pipe area, with stainless steel core, for 125 psi working pressure, normally closed, for 110 volt operation. Stainless steel strainer and solid wedge gate valve shall be installed in piping ea. side of solenoid valve. A 3/4" by-pass with solid wedge gate valve to be provided around solenoid valve, to be installed in Digester Head House.

11.09 Plunger Type Sludge Pumps: Furnish and install Duplex Plunger type Sludge Pumps in the digester head house for pumping sludge, and in the raw sewage pump station for dewatering, as shown on the drawings. The pumps shall have the following capacity.

No.Required	Location	GPM	Total Head	HP	Voltage
Two Duplex	Digester Head House	145	75	7-1/2	440 V.
One Duplex	Raw Sewage Pump Sta.	150	50	5	440 V.

Each pump shall operate under the specified head conditions without pounding and shall be capable of delivering at the specified capacity with a suction lift of 15-feet included in the total head. Suction and discharge arrangement shall be as shown on the drawings.

(a) Drive: Drive between motor shaft and sheave on countershaft shall be with multiple V-belts, suitably guarded. Reduction gears between countershaft and pump shaft shall be not less than 2-inch face nor smaller than 5 pitch and shall be completely housed to run in a bath of oil. Gear case shall be supported between two vertical frame members welded to the pump base. Eccentric on pump shaft shall be used to drive plunger connecting rod. This eccentric shall be cast iron, not less than 10" diameter and shall be supported on each face with heavy flanges. Each flange shall have substantial hubs so that plunger thrust shall be well distributed over the main shaft. The eccentric shall be provided with shear pin overload release, adjustable for varying length of stroke. Each position shall be fitted with hardened steel bushing. Connecting rod eccentric bearings shall be lined with marine grade babbitt and lubricated by an automatic sight feed oiler. Main bearings shall be heavy-duty roller or ball-bearing type, Hyatt, S.K.F., Fafnir, or the equivalent.

(b) General Pump Design: General pump design shall include sectionalized construction with separate castings for pump body and stuffing box; and shall permit removal of stuffing box, plungers and connecting rod without disturbing the pump bodies, valve chambers, manifolds, piping or main eccentric shaft.

(c) Ball Valves: Valves shall be compounded solid rubber balls at least 5-inches diameter. Valve chambers shall be provided with ball guide ribs, bevelled top and bottom to prevent clogging. Valve seats shall be independent, full-machined plates, capable of being replaced without disturbing valve chambers and piping. Plungers shall be of cast iron and provided with a drain-hole in bottom, which shall be easily opened from the top. Stuffing box shall contain not less than 5 rings of square flax, graphite impregnated, braided packing, and shall be equipped with drain lipped gland.

(d) Air Chambers: At least 8" x 30" air chambers shall be provided for both suction and discharge sides of the pump. Discharge side of the pump shall be provided with a 1-inch sampling valve.

(e) Motor: Each pump shall be driven by means of a 1200 RPM ball-bearing electric motor, designed for continuous operation under full load without exceeding its rated horsepower by more than fifteen (15%) per cent. Motor shall be NEMA standard for 40° C temperature rise with a 1.15 service factor. The motor shall be mounted on the pump by means of a locking base to permit quick adjustment of belt tension without taking pump out of service.

(f) Manufacture: At least two bids will be required for sludge pumps as manufactured by Marlowe, Carter, or Chicago Pump Company. Base bid shall be on Marlowe. Other makes may be bid as an alternate.

11.10 Payment: No separate payment will be made for work under this section of specifications. The cost of all such work and all cost incidental thereto shall be included in the price bid for the item to which the work pertains.

DIVISION ONE

SECTION NO. 12

RAW SEWAGE PUMP CONTROL EQUIPMENT

12.01 Scope: The work covered by this Section of Specifications consists of furnishing all materials an equipment and performing all labor necessary for the installation of raw sewage pump control equipment, complete, including installation of all pneumatic equipment, pneumatic piping and all appurtenances thereto as shown on the drawings, as spcified and as required for a complete and workable installation.

12.02 Work Under Other Sections of Specifications: The Contractor's attention is directed to Section No. 10 of these Specifications, entitled "Mechanical Equipment". All conditions and requirements of Section No. 10 which may affect work under this section of specifications are made a part hereof as though fully contained herein. The Contractors attention is further directed to Section No. 1 of these specifications with reference to requirements for furnishing working drawings.

12.03 Supervision: The installation of raw sewage pump control equipment and accessories shall be made in accordance with working drawings prepared by the Manufacturer, as approved by the Engineer. The Contractor shall furnish the services of a factory trained representative of the Manufacturer, whose duty it shall be to supervise installation of the equipment, place the equipment in operation, and instruct the Owner's personnel in the care and maintenance of such equipment. It is estimated that a minimum of two (2) days service on the job site will be required.

12.04 General: The raw sewage pump control system shall be an integrated and factory tested system, complete, within a single enclosure. The controls shall be of the "bubbler" or self purging type utilizing instrument air. There shall be furnished an air set, a visible flow type regulator for air flow adjustment and an air shut-off valve and air bleed valve for adjustment of level sensing devices. Independent metallic bellows, one for each Start level and one for each Stop level shall sense changes in wet well level and start or stop the appropriate pumps accordingly. The control system shall have independently adjustable start-stop settings for each step of operation. Separate pressure controls shall be furnished for emergency levels, which controls shall operate audio-visual alarms, with reset devices, and appropriate alarm lights mounted on the front of the control panel as indicated. The control system shall be adjustable within a range of 1/10 of a foot to 23-feet and shall be accurate within one (1) inch at any point within the range. The complete control system with all control devices, internal pneumatic piping and wiring shall be "AUTOCON" furnished as manufactured by the Automatic Control Company. Alternate make may be bid.

12.05 Control Panel and Control System: The Control Panel shall consist of a free standing vertical section, 12 gauge, 20-inches wide, 20-inches deep and 90-inches high, NEMA I enclosed assembly, accessible from the front through a removable hinged door, NEMA Class II type C construction with all power and control wiring run to terminal boards located at the bottom of the vertical section, and with all pneumatic piping run to terminal blocks located at the bottom of the vertical section. Wiring and piping at terminal boards and blocks

shall be identified by symbol or number for exterior field connections. The control panel shall be completely piped, wired and factory tested prior to shipment. In general, the control panel shall be furnished as specified for control centers under the Section "Electrical Work" of these specifications. Should the Contractor elect to furnish control center equipment, specified under the Section "Electrical Work" of these specifications, as manufactured by the Automatic Control Company, the control panel to be furnished hereunder shall be joined to and wired into such control center equipment.

(a) Control System: The control system to be contained within the Control Panel shall consist of a six pump "Bubbltrol" system for raw sewage wet well level control, suitable for operation on 110 volt, single phase, 60 cycle electrical current. The control system shall be set to operate the pumps in the sequence selected for "Rising Level" and "Falling Level" in the wet well. Level in the wet well shall be indicated at the panel by an 8-inch diameter gauge, with illuminated dial, graduated (0 to 150-inches). Pumps shall be transferred in operating sequence by a six-place Rotary Transfer Switch, mounted on the panel front. HOA Switches, White "Required" Lights and Red "Running" Lights shall be mounted on the panel front for each of the six pumps. Under non-operating conditions, indicating lights shall glow dimly and shall be adjustable for room conditions. Under operating conditions, indicating lights shall flare to full brilliance. To prevent the operation of more than 4 pumps at the same time, two of the six sets of sensing units shall be connected through "On-Off" selector switches, hand operated. When switches are in the "Off" position, only 4 pumps will operate in accordance with the levels to which they are connected. When either of the selector switches is in "On" position, the 5th or 6th pump, as selected, will operate in accordance with its position on the Rotary Transfer Switch shall start any pump at any of the six steps which may be selected; thus providing for six changes in operating sequence.

(b) Rising Level: The following typical sequence of pump operations shall occur on rising level in the raw sewage wet well.

Pump to Start	Pumps in Operation
Step 1 - Start A	A Running
Step 2 - Start B	A and B Running
Step 3 - Start C	A, B, and C Running
Step 4 - Start D	A, B, C and D Running
Step 5 - Start E (If selector switch is on)	E to be placed in operation only if one of above pumps is inoperative.
Step 6 - Start F (If selector switch is on)	F to be placed in operation only if two of above pumps is inoperative.

(c) Falling Level: On falling level the control system shall cut off pumps in reverse sequence to that given above at elevations shown on the drawings.

(d) Control Adjustment: The control system for the above schedule of operations on rising level and falling level shall be adjustable within a range of from 1-inch to 5-feet for each step. Accuracy of the system

shall be such as to control levels at any step within 1-inch.

(e) Alarm System: High and Low alarm points shall have independently adjustable sensors, which will activate Audio-Visual alarms on High or Low wet well level. Audio alarm shall be equipped with silencer-reset button and visual alarm light shall reset upon cessation of emergency conditions. Low level alarm shall stop operation of any running pump at the selected point.

(f) Accessory Functions: The control system shall be equipped with a "Power Failure Restoration" sequence timer. An electrical motor driven sequence timer shall be furnished for restoration of pump operation after power failure. Pumps shall be returned to automatic operation in adjustable timed sequence as required by wet well level at time of power restoration.

(g) Panel Finish, Name Plates and Setting: The panel shall be thoroughly cleaned inside and out after fabrication and given a metal primer coat and two finish coats of A.S.A. ~~49~~ 61 Gray finish. As specified under Section El [illegible] A stripable plastic coat shall be provided over the finish coat before shipment. Said stripable plastic coat shall be removed when equipment is placed in service. All devices on panel front shall have engraved phenolic name plates for identification. The panel shall be installed adjacent to the motor control center.

12.06 Pneumatic Piping: Pneumatic piping shall be furnished and installed as indicated on the contract drawings and approved manufacturers working drawings. The wet well is divided into two sections and piping shall be installed and valved so that a common level, or a level in either one section or the other shall control pumps. Materials and method of pneumatic piping installation shall be in accordance with the section "Metal Pipe, Fittings, Valves and Gates" of these specifications.

12.07 Payment: No separate payment will be made for work under this section of specifications. The cost of such work and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.

DIVISION ONE

SECTION NO. 13
CONTROL, INSTRUMENTATION AND AIR COMPRESSORS

13.01 Scope: The work covered by this section of specifications consists of furnishing all materials and performing all labor necessary for the complete installation of instrumentation and control equipment and the installation of all pneumatic piping, wiring and appurtenant work indicated on the drawings, specified and necessary for complete and workable installations.

13.02 Work Under Other Sections of Specifications: The Contractor's attention is directed to Section 10 of these specifications entitled "Mechanical Equipment." All conditions and requirements in said section which may affect materials and work furnished under this section of specifications are made a part hereof as though fully contained herein. The Contractor's attention is further directed to Section 1 of these specifications with reference to requirements for furnishing working drawings.

13.03 Supervision: The installation of instrumentation and control equipment shall be made in accordance with working drawings prepared by the manufacturer as approved by the Engineer. The Contractor shall furnish the services of a factory trained representative of the manufacturer who shall supervise the installation of the equipment, place the equipment in operation and instruct the Owner's personnel in the care and maintenance of such equipment. Estimated service time is two (2) days.

13.04 Manufacture: All instrumentation and control equipment furnished under this section of specifications shall be furnished as manufactured by Builders-Providence, Inc., Simplex Valve and Meter Company, Foxboro Company, or approved equal.

13.05 Instrument Mounting Panels: Instrumentation and control equipment furnished under this section of specifications to be panel mounted shall be mounted on sectional instrument mounting panels and shall be installed in the control building in the location shown on the drawings. Panels shall either be for front access or shall be equipped with a hinged side access door, and shall be in accordance with the following:

(a) Construction: Instrument mounting panels shall be assembled from 20 x 20 x 90 x 12 gauge or 40 x 20 x 90 x 12 gauge rolled steel. Panel sections shall be of the all welded box columnar type cubicle, reinforced with hand type base and crown sheets welded in place, and shall be either equipped for access from the front or with hinged side access door fastened with speed lock type fasteners. Panels shall be of the same depth as the electrical control center panel specified under the Section "Electrical Work" of these specifications.

(b) Assembly, Piping, Wiring: Panel shall be completely assembled in the shop, with all instruments and control devices shown on the drawings or specified for installation therein to be mounted in the shop, and with all such instruments and control devices to be shop wired and piped to control terminals, strips and bulkhead fittings. Openings shall be provided in the base sheet of each panel section to provide access for field connections. All wiring and piping shall enter and leave cubicles from below.

(c) Finish: Instrument panels shall be finished in light gray enamel as specified under the section "Electrical Work" of these specifications. A strippable plastic coat shall be provided over the finish coat before shipment, which strippable coat is to be removed after equipment is placed in operation.

(d) Nameplates: Each instrument or control device shown on the drawings and/or specified to be mounted on instrument panels furnished under this section of specifications shall be equipped with suitable individual nameplates with the proper nomenclature for the associated instrument or device.

13.06 Metering Equipment; Parshall Flumes: Work under this contract includes the installation of three Parshall flumes; designated as Parshall Flume No. 1 and 2 located at the entrance to the raw sewage wet well; and Parshall Flume No. 3 located at the effluent of the primary settling tank. Parshall flumes shall be of the dimensions and throat size shown on the drawings and in accordance with instrument manufacturer's standards. Parshall flumes shall be accurately constructed of concrete with a built in sheet aluminum throat liner which shall be pre-fabricated and installed within the formwork by the Contractor before the concrete is poured.

(a) Throat Liners: There shall be installed in each Parshall flume prior to pouring concrete a metal throat liner constructed of aluminum having a thickness of 3/16 inches and a throat width of 18 inches for all Parshall flumes. The throat liner shall be fabricated from three pieces of aluminum, one forming the bottom and the other two forming the sides. Each piece of aluminum shall be bent to proper form in accordance with standard Parshall flume dimensions. Throat liner shall have angles of the same material as sides and bottom which shall be securely riveted together with form sheets to form a single rigid structure of the entire throat liner. Across the top of the throat liner there shall be a minimum of three straps riveted in place to strengthen the sides. The liner shall be furnished completely assembled and ready for installation in formwork. The overall length of the Parshall flume throat liners shall be approximately 50 inches. The height of the liners when measuring from the invert shall be approximately 36 inches. Flume throat liner complete with transmitter and receiver to meter flow through Parshall flumes shall be furnished by the same manufacturer.

(b) Transmitters: A pneumatic flow transmitter shall be furnished and installed for each Parshall flume. Flow transmitters shall be housed in panel stand type weatherproof cases which shall have visible indicator dials mounted therein. Panel stand type weatherproof cases shall be located at Parshall flumes over stilling wells as indicated on the drawings. There shall be installed within the weatherproof case an air set consisting of a pressure regulator, gauge and filter. A pneumatic flow transmitter shall sense level changes in the flume by means of a float. The pneumatic transmitter shall convert the float level into a linear signal ranging from three to fifteen p.s.i. in direct proportion to the rate of flow through, or the head in the approach section of the Parshall flume. This pneumatic signal shall operate indicators mounted in the weatherproof panel stand type case and shall operate receivers mounted in the instrument and control panel. Transmitters with associated receivers shall operate within 2% accuracy over a 10 to 1 range.

(c) Indicators: Each panel stand type weatherproof case containing the above transmitter with its associated float shall be equipped with a visible indicator to be operated by the above transmitter. The indicator shall be approximately 9-inches in diameter and shall be calibrated as specified for its respective Parshall flume meter receiver. Dial shall be graduated uniform to rate of flow.

(d) Receivers: Pneumatic receivers shall be furnished for each transmitter. The receivers shall indicate, record and totalize flow through their respective Parshall flumes operating by the signal from the transmitter specified above. Receivers shall be equipped with seven-day electric clock driven charts, shall indicate and record on a separate dial and shall be housed in a pressed metal or cast aluminum case with a light gray enamel. Receivers shall have illuminated dials, shall be graduated uniform to rate of flow and shall be calibrated in accordance with the following:

Receiver No. 1 - Calibrated for flows 0 to 15 M.G.D. through Parshall Flume No. 1
Receiver No. 2 - Calibrated for flows 0 to 15 M.G.D. through Parshall Flume No. 2
Receiver No. 3 - Calibrated for flows 0 to 15 M.G.D. through Parshall Flume No. 3

Receivers shall be furnished with a year's supply of charts, pens, ink and necessary instrument oil.

13.07 Metering Equipment: Insert Venturi Type: One 16-inch standard concentric type insert venturi tube complete with transmitter and receiver shall be furnished and installed in the recirculation line as indicated on the drawings. The insert venturi tube shall have both upstream and downstream section mounted on a common supporting flange, arranged for insertion between standard 125 lb. flanges. The throat section shall include a complete annular pressure ring, which in effect shall be the interior of the mounting flange, and from which the low pressure metering tap shall be taken. The annular ring shall be connected to the interior of the tube by a suitable number of accurately screened holes drilled through a complete bronze throat liner. The insert venturi tube shall be especially designed for sewage measurement including a single tap at both main and throat equipped with a continuous flushing system. The flusing system shall be complete with bayonet type cleanouts, one pair of sight feed regulators properly graduated for the required quantity of flushing water, shut off valves and special check valves for installation in the lines connecting the venturi tube with the mercury float cylinder of the meter transmitter specified below to operate with the insert venturi. Insert venturi tubes, complete with transmitters and receivers, shall be furnished by the same manufacturer.

(a) Transmitter: Transmitter shall be of the mercury well type which shall convert venturi differential to a pneumatic linear signal ranging from three to fifteen p.s.i. in direct proportion to a flow. Transmitters shall be pipe stand mounted and enclosed in a weatherproof case. Transmitters shall be similar to Builders-Providence Type ATUAX or Simplex Valve and Meter Type PNG.

(b) Receiver: A pneumatic receiver shall be provided for operation with the above transmitter. Receiver shall be as specified for Parshall flume

receiver and shall be Builders-Providence Model ARB-TIR or the equivalent, or Simplex Model H-TIR for the following flow ranges:

1. Recirculation Meter - Calibrate 0 to 5 M.G.D.

13.08 Automatic Bar Screen Control System: There shall be furnished and installed an automatic bar screen control system for control of the screens installed in the screen and grit chamber. The system shall consist of an instrument which will, by means of bubble tubes installed ahead of the screen and behind the screen, indicate the differential water level across the screen. The instrument shall be equipped with an indicating dial or pointer for selecting set point to start the screen, at any preselected differential across the screen within the range of the instrument. The instrument for indicating and adjusting set point shall be mounted in the instrument and control panel specified under this section of specifications by the manufacturer of said panel. The screen control system and the operation thereof shall be in accordance with the following:

(a) Equipment Required: The following equipment shall be furnished as manufactured by Builders-Providence, Inc., Simplex Valve and Meter Company, Foxboro Company, or approved equal. Equipment not listed below, but necessary for the proper operation of the bar screen in the manner specified shall also be furnished.

(1) Differential Level Controller: Controller, panel mounted with differential and set point indicators with adjustable contacts, and with additional devices necessary for operation of the bar screen in the manner specified.

(2) Air Flow Restrictor Devices: With adjustable restrictor for air calibrated flow scale and visible sight feed. These devices shall be installed in a convenient location within the instrument and control panel with one device provided for each of the two bubble tubes installed to measure water differential across the screen.

(3) A differential pressure regulator for constant downstream differential to bubble type system.

(4) Necessary air set small wiring and piping as required for complete system.

(b) Operation: The screen control system shall operate through the H-O-A switch to be mounted in an exterior location; shall have a range of 0 to 24" of water differential across the screens, with the instrument calibrated for the specified range, and shall have fully adjustable contacts to perform the following functions:

(1) At a predetermined differential in level across the screen, the screen shall start and shall continue to operate until the differential across the screen has been reduced to at least 1". The screen shall stop after the differential has been reduced to at least 1" by means of a limit switch to be furnished by the screen manufacturer mounted on the bar screen head section.

(2) The instrument mounted in the instrument and control panel

shall continuously indicate both control set point and measured differential across the screen on the uniformly divided scale graduated from 0 to 24".

13.09 Final Effluent Recirculation Control System: The final effluent recirculation control system shall operate through a 16" rate of flow controller to return final effluent sewage to the raw sewage wet well to perform either of two preselected control functions. One control function shall consist of maintaining a preselected effluent recirculation flow of 0 to 5 M.G.D. The other control function, which may be selected by means of a selector switch on the instrument and control panel, shall proportion the recirculated effluent flow to a maximum of 5.0 M.G.D., with the total plant influent flow to maintain a preselected total flow rate of combined raw and recirculated sewage through the plant of from 0 to 10 M.G.D., all in accordance with control diagrams indicated on the drawings. Equipment required for operation of the system shall be in accordance with the following:

(a) Pneumatic Summator; Total Plant Influent: Output signals proportional to flows from transmitters on Parshall Flume No. 1 and Parshall Flume No. 2 shall be received by a two unit pneumatic summator which shall produce an output signal of three to fifteen pounds proportional to the sum of signals from No. 1 and No. 2 flume transmitters. The summator signals shall be transmitted to a receiver mounted in the instrument panel and to an additional two unit summator which is part of the recirculation flow control system. The receiver mounted on the instrument and control panel shall be furnished as specified for Parshall Flumes and shall indicate, record and totalize all flows from 0 to 15 M.G.D.

(b) Summator; Recirculation Control System: A two unit pneumatic summator shall be furnished and installed within the instrument and control panel for operation with the recirculation flow control system. This unit shall receive a signal from the total influent flow summator and from the recirculation flow transmitter and shall produce an output signal ranging from three to fifteen pounds proportional to the sum of the two signals. This output signal shall be transmitted from the summator to a "Nullmatic" controller.

(c) "Nullmatic" Controller: The "Nullmatic" controller shall be furnished as a part of the recirculation flow control system and installed within the instrument and control panel. This unit shall receive the signal from the above summator and a signal from the total plant flow rate set station, shall combine these signals and shall produce an output signal which will control the rate of flow controller to give the desired plant flow.

(d) Rate of Flow Controller: The rate of flow controller shall combine a set rate signal from a selector switch and the flow rate signal from an insert venturi so as to position a pnuematic cylinder operated butterfly valve through a pneumatic positioner to establish and hold the desired set rate of flow and to change set rate of flow as required by the set rate signal. The rate of flow controller shall receive a signal ranging from three to fifteen pounds through a selector switch from either the "Nullmatic" controller or the recirculation set rate station. Pneumatic cylinder operated butterfly valves shall be furnished as specified under the section "Metal Pipe, Fittings, Valves and Gates."

Rate of flow controller shall be Simplex Model BFP or the equivalent furnished as manufactured by Builders-Providence or Foxboro.

(e) Rate Set Stations: Two pneumatic rate set stations consisting of the following devices shall be furnished and installed in the instrument and control panel as indicated on the drawings. One rate set station shown on the drawings as the "recirculation rate set station" shall be for the purpose of directly setting a recirculation rate of flow through the above controller, which rate will remain constant at the preset value. The other rate set station known as the "total plant rate set station" shall be for the purpose of establishing a rate, combining the plant influent with the recirculation so as to establish a total minimum flow rate through the plant. This station will operate through the "Nullmatic" controller.

(1) Set Rate Indicators: A set rate indicator consisting of an indicating gauge approximately three inches in diameter shall be furnished for each rate set station. The recirculation rate indicator shall be graduated from 0 to 5 M.G.D. The total plant flow indicator shall be graduated from 0 to 10 M.G.D.

(2) Manual Rate Setter: A manual rate setter of the pressure reducing type shall be installed for each rate set station for manually setting desired rates of flow.

(3) Selector Switch: A pneumatic selector switch shall be provided for selecting the station desired to control recirculation flow rate.

(f) Other Equipment and Piping: Other equipment and devices, including all necessary piping, shall be furnished and installed to provide for the operation of the complete recirculation flow control system for the purpose intended.

13.10 Instrument and Control Panel: Installation of Devices: Instruments, control devices and switches to be mounted on or to be contained within the instrument and control panel shall be in accordance with the following:

(a) Instruments and Controllers: The following instruments and control devices shall be flush mounted in the instrument and control panel for visibility and operation from the panel front:

(1) Bar Screen Controllers and differential level indicators.

(2) Receiver for Parshall Flume No. 1.

(3) Receiver for Parshall Flume No. 2.

(4) Receiver for Summation of Flumes No. 1 and 2.

(5) Receiver for Parshall Flume No. 3.

(6) Set Rate Selector Switch and two rate set stations, complete with indicators for recirculation rate of flow control.

(b) Devices Mounted Within Panel: The panel back shall be equipped

with properly sized access doors complete with speed lock fasteners in front of which shall be mounted the following devices:

(1) Pneumatic Air Sets and Pressure Reducing Valves.

(2) Sight flow indicators for pneumatic control devices.

(3) Summators and "Nullmatic" controller.

(4) Other devices not listed which may require frequent access for inspection and/or adjustment.

13.11 Air Supply System: The following equipment shall be furnished and installed to provide instrument air supply:

(a) Air Compressors: Air compressors shall consist of two Worthington or equal receiver mounted air compressors on concrete foundations, each to be 1/2 horsepower, Model 1/2U-1, for operation between 100 to 125 lbs. to provide pressure air for receiver. Air compressors shall be furnished complete with starters and controls with one machine set to cut in at 110 lbs. and cut out at 125 lbs. and the other machine set to cut in at 90 lbs. and to cut out at 110 lbs. Controls shall be ranged so that machines may be alternated automatically. Motors shall be 3 phase, 440 volts.

(b) Air Receivers: Receivers shall be furnished as a part of the unit and installed as indicated on the drawings and as recommended by the manufacturer of the machines. The air receiver shall be built in strict accordance with the ASME boiler construction code for unfired pressure vessels. The receiver shall be hydraulically tested at the pressures specified and the referenced code and warranted safe and tight under 165 pounds working pressure. The receiver shall include necessary safety valve, pressure guage and drain cock.

(c) After Cooler Filter: An after cooler filter shall be furnished and installed with necessary cool water connections between the air compressor and the main line instrument air pressure reducing valve indicated on the drawings. The after cooler filter shall be Model M-100 "Condensifilter" as manufactured by the Hankerson Corporation or the approved equal. Dimensions of the "condensifilter" are approximately nine inches in diameter and thirty-four inches in height. The after cooler filter shall be furnished for a maximum working pressure of 200 p.s.i. with rated capacity of 100 S.C.F.M. and at 100 p.s.i.g. Themechanism shall be equipped with a water cooler condenser constructed of non-corrosive materials with approximate condensing area of 940 square inches and with cooling water requirements of two to two and one-half G.P.M. An automatic drain valve shall be provided for the condensate collection chamber. The filter shall be of the disposable filter cartridge type with approximately twelve square feet of effective filtration area and shall be easily removed and replaced. A minimum of three spare filters shall be furnished, with the after cooler filter.

(d) Air Compressor Accessories: Air compressors shall be furnished as specified above, complete with motor, manual and automatic starters, pressure switches, safety valve, properly sized inlet air filter and intake muffler and other necessary accessories.

13.12 Gas Metering Equipment: Furnish and install equipment for metering gas production from each of the two digesters. The equipment shall consist of an orifice plate type differential producer with an indicating and totalizing receiver for each digester. Two complete meters will be required, one for each digester. Gas meters shall be furnished as manufactured by Foxboro Company, or approved equal. Each gas metering system shall be capable of measuring all gas flows from 0 to 5,000 cubic feet per hour at a maximum head loss not to exceed 1/2" of water. Metering equipment shall consist of the following:

(a) Differential Producer: Each differential producer shall consist of a stainless steel orifice plate furnished for installation in a 4" gas line.

(b) Meter: Furnish and install the following instrument for indicating and totalizing the flow of digester gas.

The instrument shall use a bell suspended within a chamber by a calibrated spring. The lower edge of the bell shall descend into a circular well filled with mercury. Differences in pressure between the upper and lower bell surfaces shall displace the bell until equilibrium exist between the differential pressure and the calibrated spring.

The instrument shall measure a differential pressure of 1/2 inch of water. It shall have a static pressure rating of 150 psi. It shall be provided with manifolding plus approximately 6-1/2 pounds of mercury.

The integrator shall be of the impulse-duration type utilizing a cam revolving continuously at a constant 5 rpm. The cam shall be driven by a synchronous electric motor, explosion proof, operated from 115 volts, 60 cycle AC power. A follower-arm actuated by the flow measuring device shall for a portion of each 12-second cycle of the cam be positioned so as to lose contact with the cam for a period of time proportional to the magnitude of the flow measurement. During the time period when the follower-arm is off the cam, a switch shall be automatically closed to actuate the electric integrator counter motor. This same process shall be repeated for every 12-second cam revolution.

The counter shall have eight digits and shall read in the desired flow units using a multiplier which must be a whole power of 10.

The integrator shall be Type 24 of Foxboro manufacture or equal.

The instrument shall be provided with an eccentric indicating scale. The scale shall be black with white markings.

The entire mechanism shall be mounted in a rectangular 12" dustproof case designed for wall mounting and suitably finished for the service. The Contractor shall furnish complete installing and operating instructions and other accessories needed for routine installation, operation and maintenance.

The instruments shall be Model of the Foxboro Company manufacture or equal.

13.13 Piping: Pneumatic and hydraulic supply and control piping shall be furnished and installed in accordance with the applicable requirements of these specifications, as indicated on the contract drawings, as detailed on the manufacturer's working drawings, and as necessary to provide for the complete operation of the entire instrumentation and control system.

13.14 Electrical Work: A 110 volt source of control power shall be provided in the motor control center. Control circuits for operation of all devices controlled by switches specified to be mounted on the instrument and control panel shall be run to appropriate terminals located on the terminal strips in the proper panel. Electrical work shall be as indicated on the drawings, as specified under the applicable sections of these specifications and as required for the complete operating instrumentation and control system as specified.

13.15 Payment: No separate payment shall be made for work under this section of specifications. The cost of all such work, and the cost incidental thereto shall be included in the item to which the work pertains.

DIVISION ONE

SECTION NO. 14

CHLORINATION EQUIPMENT

14.01 Scope: Furnish and install one (1) V-Notch Chlorinator of 2000# maximum capacity but equipped with a 500# meter and scale, extra rota meter, all tank valves and flexible tank connections, header valves, external chlorine pressure reducing valve and gages; one (1) Foxboro Model 40 Cam-Set Controller vacuum time-pattern transmitter with four extra cams; one (1) Mansaver Style 1118 or equal grab for ton cylinders; gas mask, chlorine test set, and other accessories listed below.

The equipment shall be as manufactured by Wallace and Tiernan, Inc. or approved equal. No apparatus will be considered which is in an experimental stage and which has not been in successful commercial operation in the form specified for a period of two years.

The installation of the chlorine control equipment and accessories shall be made in accordance with the working drawings prepared by the manufacturer and as approved by the Engineer. The installation shall be made under the direct supervision of a factory trained engineer furnished by the manufacturer who shall also instruct the operator in the care and maintenance of the equipment. The manufacturer's representative shall cooperate with the Engineer in making such tests as are necessary to demonstrate that the equipment is in good working order. A sufficient supply of chlorine will be furnished by the Owner for the purpose of properly conducting all tests as directed by the Engineer. The manufacturer shall furnish an engineer to make inspections of the equipment each sixty day period for 12 months after installation. All necessary adjustments to equipment shall be made and instructions to operators shall be furnished.

14.02 Chlorinator: The V-Notch Chlorinator shall be of the solution feed, vacuum type and have an overall capacity range of 4# to 2000# per day. The unit shall be floor-mounted in a self-supporting fiber glass cabinet and consist of a chlorine pressure regulating valve, rota meter feed rate indicator, V-Notch variable orifice, vacuum regulating valve, pressure vacuum relief valve, drain and air relief valve, water operated ejector with check valve, and with adjustable insert plug. The chlorine pressure regulating valve shall maintain the proper operating vacuum ahead of the V-Notch variable orifice and provide a positive chlorine gas shut-off if operating vacuum is lost. The rota meter feed rate indicator shall read directly in pounds chlorine per 24 hours and shall be calibrated over a 20:1 range. The vacuum regulating valve shall maintain the proper operating vacuum downstream of the V-Notch orifice, and the pressure vacuum relief valve shall provide safety pressure relief and vacuum relief. The injector shall be of the aspirator type with an adjustable insert plug.

14.03 Program Control of the chlorinator will be accomplished by use of a Foxboro, or equal, Model 40 Cam-Set Controller with vacuum transmitter. The controller will be furnished complete with 115 V, 60 cycle motor with four cams which may be cut for the feed rate program desired; and will actuate the chlorine feed in accordance with the position of the control arm of the transmitter. The unit will be totally enclosed in a cabinet and suitable for wall mounting.

14.04 Accessories: There will be furnished the following accessories: four (4) yoke type auxiliary tank valves with yokes for ton cylinders, four (4) flexible tank connections; three (3) chlorine header valves; two (2) chlorine line pressure gages; one (1) chlorine pressure reducing valve; chlorine line strainer, and inlet heater for chlorinator; one (1) extra rota meter and V-Notch plug; one (1) chlorine comparator of the permanent color glass disc type with range of 0.10 to 2.0 ppm reading, together with leather carrying case; one (1) chlorine gas mask with extra cannister; one (1) Mansaver Style 1118 or equal Grab for ton cylinders; all inter-connecting schedule 80 PVC gas pipe from chlorinator to injector, and all PVC solution discharge pipe from injector to point of application.

14.05 Scales: Provide one (1) Beam Scale, steel box enclosure, double pillar, 7200 lb. capacity, 60" x 48" platform size, similar to Fairbanks No. B60-48-36WT.

14.06 Utilities and Chlorine Building Appurtenances: The Owner shall provide water service to within five feet of the Chlorine Building. The Contractor shall furnish all other labor and materials to complete the piping installation as shown on the drawings or as required for the proper operation of the equipment.

The Owner shall furnish single phase 115/230 V, 60 cycle AC electrical service to the location shown on the plans and the Contractor shall furnish all labor and materials to complete the electrical work as shown on the plans or specified under Section 15.

Heaters, Fans, Hoist and other appurtenances shall be as specified under Section 9 or as shown on the plans.

14.07 Payment: No separate payment will be made for work under this section. The costs of all such work and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.

14.08 Elimination of Chlorine Building and Equipment: The Owner reserves the right to eliminate the Chlorine Building and equipment and to apply the deduction listed in the Proposal for the elimination of this work.

SECTION NO. 15

ELECTRICAL WORK

15.01 Scope of Work: The work shall consist of furnishing and installing all controls, switches, panels and necessary electrical material, equipment and labor necessary to completely wire, install and connect up all electrical equipment and fixtures in accordance with the plans and specifications. The Contractor shall be responsible for making a complete working installation conforming to best practice and he shall furnish and install all necessary items whether specifically called for in the specifications or not.

The capacities of various items of electrical equipment, horse power of motors, wire sizes, etc., given in the specifications or shown on the drawings are obtained from sources believed reliable but are not guaranteed. It will be the Contractor's responsibility to verify all motor loads from the manufacturer of the equipment he proposes to furnish and to make proper allowance therefor in his bid. Motors of larger horse power than given in the tabulations or drawings may be used only after specific approval by the Engineer after complete data has been submitted. All expense for increased sizes of wiring, starters, branch and main breakers, and other electrical equipment shall be borne by the Contractor without claim for extra cost.

15.02 Power Service: The Georgia Power Co. will provide on a pole in the approximate location shown on the drawings a transformer bank to furnish 460 volt power for this installation. The Contractor shall furnish and install in two 4 inch conduits, two parallel circuits each consisting of three 250 MCM copper, 75 degree, type RHW cables, from these transformers to the incoming main breaker. These circuits shall terminate at the transformer end in 4 inch aluminum conduit risers at least 7 feet high with weather heads and drip loops to connect to the Power Co. bus. These conduits shall enter the building so as to line up with the incoming section of the motor control center.

15.03 Requirements: The latest regulations and standards of the National Electric Code, the National Electric Safety Code, the American Institute of Electrical Engineering, the American Standards Association and the National Electric Manufacturers' Association shall be considered as included in these specifications and all requirements shall be fully met.

15.04 Guarantee and Tests: The Contractor shall guarantee to make good any defects in material or workmanship which may develop in his work within one year from date of acceptance of the work. The installation shall be entirely free from improper grounds, short circuits, or other defects. All wiring shall have a dielectric strength between conductors and between conduits and ground of not less than the value recommended in the National Electric Code. All tests shall be made in the presence of the Engineer or his authorized representative. The Contractor shall furnish assistance in performing these tests as required by the Engineer.

15.05 Approval of Equipment and Materials: Before commencing any construction work the Contractor shall submit to the Engineer for approval, six (6) sets of manufacturer's descriptions, dimension drawings and schematic internal connections of all equipment he proposes to install. He shall also provide manufacturers names, catalogue number and adequate description of characteristics of all small devices, where this is necessary to understand its operation or its adequacy to the function it is to fulfill. Approval must be obtained before

proceeding with construction or installation. Any materials or equipment delivered to the site prior to approval of drawings or lists of equipment will be at the Contractor's risk. All electrical materials shall be new and where listed by the Underwriters' Laboratories, Inc., shall meet its requirements and shall bear its label.

15.06 Materials and Equipment:

(a) Underground circuits where shown in conduit shall be in Johns-Manville Transite conduit in earth without concrete encasement, installed in accordance with manufacturer's instructions. Care must be exercised to insure that conduit will not settle but remain in straight lines and must be covered with at least 24" of soil. Diameter shall be ample for size of cables specified.

(b) Pull boxes of cast iron or concrete with cast iron cover shall be installed at such locations as may be necessary to facilitate pulling in the conductors without undue tension, with proper allowances for pulling around bends.

(c) All galvanized rigid steel conduit shall be made by the electric galvanizing, hot dipping or sherardizing process. Flexible conduit where required for connections shall be U. L. Standard, with prefabricated breaking lines. Rigid aluminum conduit may be used in 2" size and larger. Where aluminum conduit is installed under ground, paint with asphaltum. Where conduit runs in concrete cross building expansion joints, O. Z. Manufacturing Co. type "DX" expansion and deflection fittings shall be used.

(d) Structural steel shapes shall be galvanized in accordance with A.S.T.M. publication A-123.

(e) Accessories shall meet the following standards of the Underwriters' Laboratories, Inc.

Item	Standard No.
Conduit Fittings	514
Outlet Boxes	514
Cabinets	50
Panel Boards	67
Explosion Proof Fittings	886

(f) Wire and Cable: All power and lighting circuits shall be of stranded coated copper except that Size No. 10 and below may be solid. The minimum size shall be No. 12 except that No. 14 may be used for control circuits. Power and light cables shall be insulated with 75 degree, 600 volt, rubber with an overall neoprene jacket and of the following type:

Type RHW (GE Spec. SI-58006 or approved equal.)

All conduit shall be sized for the extra jacket. Wiring for outdoor overhead and inside of buildings above ground shall have standard thickness neoprene jacket, with conduit made oversize where recommended by the wire manufacturer.

Minimum wire size shall be #12, except that #14 may be used for control wiring. Minimum wire sizes shall be exceeded wherever necessary to avoid voltage drop in excess of 3%. Motor H.P. shall be verified from each manufacturer and wire sizes increased for larger motors than given on the diagram at the Contractor's expense.

Control cable shall consist of 7-stranded coated copper with 3/64 inches of color coded thermo-plastic insulation around each conductor, a reinforcing tape over assembled conductors and an overall tough plastic jacket in accordance with specification A.S.T.M. D-734 and General Electric Specification SI-58173 or approved equal. Wherever splices are necessary in control cables, a watertight junction box with screw terminals shall be used.

At the end of long runs on feeders and motor branch circuits are in all pull boxes and manholes, conductors shall be tagged to identify conductors.

(g) Wall Receptacles: Receptacles, except where otherwise indicated on drawings shall be of the duplex type rated at 15 amperes, 125 volts, Hubbell #5252 or explosion proof as indicated. Where receptacles are indicated of a capacity greater than 10 amperes such receptacles shall be of the single type having capacity to carry their rated load continuously without damage. Each such receptacle shall be provided with armored cap with cord grip and shall, where conduit or cable system is grounded, be provided with separate pole for grounding purposes. All receptacles shall be mounted 48 inches above the finished floor unless otherwise noted on the plans.

(h) Wall Switches: Wall switches shall be A.C. rated switch type. Operating handle shall be constructed of brown phenolic compound. Single pole, double pole or 3-way switches shall be rated 15 ampere, 120 volt, similar to Hubbell #1201, except where otherwise noted. All switches shall be suitable for the control of lamp loads shown on the drawings and shall carry the marking the Underwriters' Laboratories, Inc. Switches in the valve rooms of the digester head house shall be explosion proof. All switches shall be mounted 48 inches above the finished floor unless otherwise noted on the plans. Where two or more switches are mounted together, they shall be installed in gang condulets, with guarded type switch plated.

(i) Lighting Fixtures: Lighting fixtures shall be furnished and installed in accordance with the schedule and as indicated on the drawings. All lamp bulbs and fluorescent lamps shall be furnished by the Contractor. Furnish all necessary wiring and conduits from the light panels to various fixtures and switches shown on the drawings. Manufacturers' names and model numbers are used for identification as to type and quality required. Competitive units may be offered if desired, but shall be accompanied by complete catalog data and a statement regarding any deviation from the fixture listed in the schedule.

15.07 Explosion Proof Work: All electrical materials and work performed in the valve room of the digester head house shall be furnished, constructed and installed so as to be explosion proof.

15.08 Wiring: All wiring shall be installed in accordance with the provisions of the N.E. Code. Wiring, except where otherwise noted, shall be in galvanized

rigid conduit. Sizes shall be as required by the N.E. Code for the wire types specified.

All distribution of power and light circuits to the various meters, equipment and fixtures shall be made from the bottom of the control centers and other panels. In general, all conduit for 3-phase power circuits shall be run exposed except for locations where slabs are constructed on earth or over wet wells; in which case the conduit shall be concealed in the slab. Conduit for single phase power and light circuits in superstructures shall be run concealed in main walls and roof slabs except that conduit for explosion-proof wiring in digester valve house shall be run exposed. In buildings below the entrance floor level conduit for single phase power and light shall be run exposed.

Entrance of conduits into control centers from the bottom and through building walls shall be made through sleeves set in the forms before concrete is poured, making provision for sealing the annular space between conduit and sleeve so as to be watertight through walls and essentially gas tight through concrete floors.

15.09 Outlets: The location of outlets as shown on the various drawings shall be considered as approximate only. It shall be incumbent upon the Contractor to study all plans with relation to spaces surrounding each outlet in order that his work may fit the work of others and that when fixtures or other fittings are installed they will be symmetrically located if possible, and will best suit each condition.

15.10 Grounding: There shall be laid in the earth a 4/0 bare copper wire as a main ground, running the length of the incoming flume structure and control building at approximately elevation 595 at the east end and 580 at the west end and thence following the overflow pipe to the river at the bottom of its ditch. This grounding wire shall be located at least two feet from the building wall and as far from the overflow pipe as is convenient without additional excavation. In backfilling it shall be surrounded by clay earth. At the river end this 4/0 cable shall be bonded to three 3/4" copperweld ground rods, spaced 3' apart, driven 8' into the river bed at edge of the low water line.

This ground wire shall be brought through the north wall of the control building at approximately the same place as the conduits carrying the main power cables, but below them. If it is embedded in concrete walls at points where water might seep through between the strands it shall be filled with solder. After entering the building #4 bare copper shall be used to braise to this ground wire the power and lighting circuit neutrals, motor frames, steel columns, girders, hoist rails, load center frame work and with #6 wire the cases of such other starters, panel boards, lighting fixtures and conduit as is required to be grounded by the NEC. Any galvanized steel city water piping shall also be bonded to this ground wire.

At the Digester Head House, there will be a buried 2" or less galvanized steel city water pipe, to which similar #4 and #6 bare copper shall be bonded to accomplish the NEC grounding requirements.

15.11 Control Center Equipment - Control Building and Digester Head House: The control centers, complete with all equipment installed therein, shall be furnished and installed in the locations shown on the drawings.

(a) Manufacture: Enclosed control centers shall be equivalent to those manufactured by General Electric, Westinghouse, or Autocon. Circuit breakers,

starters, instruments and other equipment shall be equivalent to General Electric or Westinghouse. Wherever individual items of equipment are identified by a manufacturer's serial, class or catalog number, such numbers are given for identification as to type and design features which shall be provided and not as a limitation to manufacturer, unless the phrase "or equal" has been omitted. The use of the products of any of the above manufacturers does not constitute a waiver of any requirement of these specifications.

(b) Complete Work Required: The electrical equipment covered in these specifications is intended to operate as a complete system with each part dependent upon others. The different control centers, panel boards, other equipment mounted separately remote from control centers, and interconnecting cables shall be coordinated by the Contractor (or subcontractor) and the manufacturer of the control centers. Wiring diagrams shall be provided for each load center and an overall diagram which coordinates the individual diagrams. Make full provision in control centers for terminals for connecting equipment mounted outside of or remote from load centers, also for relays and other miscellaneous electrical equipment specified to be mounted in the load center.

The Contractor shall be responsible for seeing that wiring diagrams of equipment from different manufacturers shall have the terminals so labeled that there shall be no confusion in connecting outside devices to those in the control centers or to each other.

(c) Control Center; General: The motor control centers shall contain equipment indicated in the one line diagram and arrangement sketch and as specified for the particular location. Equipment shall be suitable for the 460-volt, 60-cycle, 3-phase service, and 120/208 Y volt, three phase service. Unless shown on the drawings or specified to be of greater depth or width, control centers shall conform to the standard specifications herein.

(1) Construction: Each control center shall consist of vertical sections, each 20 inches deep, 20 inches wide, and 90 inches high, joined together inside of structure to form a rigid, free-standing, completely dead-front, NEMA I enclosed, control assembly, using Class II, Type C construction. Power shall be distributed by means of a continuous bus. All control units shall be assembled with control leads brought out to master terminal boards located at the bottom of each vertical section. Complete wiring diagrams and outline shall be furnished. Each section shall be designed so that control units may be readily removed or added, and wiring performed from the front. Terminal strips shall provide lugs and screws for both wires it connects together, so that removing one will not loosen the other.

(2) Bus Compartments and Wiring Troughs: Each vertical section shall be provided with two horizontal bus compartments, one at the top and one at the bottom which shall line up with adjacent units to form convenient wiring troughs, the entire length of the control center. Each bus compartment shall have removable covers. There shall also be provided in each vertical section a vertical wiring trough and vertical line bus bars to distribute incoming power. Isolating barriers between units shall be easily removable to facilitate installation of outgoing wiring. All bus work will be

suitably braced to withstand a maximum of 25,000 RMS amperes short circuit current. Bus supports shall be formed of high dielectric strength, low moisture absorption molded compound with high impact strength and high creepage surface.

(3) Interchangeability: Circuit breaker or combination starter units shall be in interchangeable combinations of 14" modular heights and all units up to and including NEMA size 3 shall be line plug-in type. Plug-in units shall have silver plated pressure type line disconnecting stabs. Each unit shall be so designed that it may be locked with stabs disconnected from the bus. Each unit shall be held in place by means of cam fastener screws arranged so that units may be removed or remounted without having access to the rear of the structure and without any parts falling out of place. Each unit shall be designed to provide isolation and baffling of one unit from the others. Each starter section shall be provided with flange-formed doors with concealed hinges for all starter units and shall have removable flange-formed covers on the rear for units accessible from back.

(4) Cable Location: Incoming power cables will enter the control center from the bottom.

(5) Circuit Breakers: Air circuit breakers on incoming lines into the control center shall be rated for at least 15,000 amperes short circuit interrupting capacity. Other breakers shall be rated at 7,500 amperes or more, interrupting capacity, except that breakers in panel boards of 5,000 ampere interrupting capacity.

(6) Starters: Starter units for motors shall be of the combination circuit breaker magnetic contactor type, full voltage, non-reversing, with plug-in features providing both inverse time thermal overload, under voltage and instantaneous short circuit protection. The external operating handle of the air circuit breaker shall be interlocked with the door so that the handle must be in the OFF position before the door can be opened. This handle shall be arranged for padlocking either in the ON or OFF position with from one to three padlocks. A manual reset button shall be mounted in the door of each unit. All starters shall be equipped with 110 volt contactor coils.

(7) Panel Boards: Lighting and small power panel boards for 120/208Y volt, 4 wire, distribution, shall have a solid neutral, lugs in mains, thermal magnetic trip breaker and be equivalent to Type NLAB. Provide directory of circuits on inside of the door.

(8) Drawings: The manufacturer shall submit the following drawings for approval by the Engineer prior to fabrication and assembly of control centers: (a) complete wiring diagrams, including schematic, (b) dimension drawings with unit data and (c) floor plan. Wiring diagrams shall show control terminals in approximate physical location with readable designations so owner in future can trace circuits easily when locating trouble. All devices and control centers shall be of manufacture as approved by the Engineer.

(9) Nameplates: Engraved non-corrosive nameplates shall identify each device with designation indicated on the drawings.

(10) Finish: Each structure shall be thoroughly cleaned inside and out after fabrication. It shall then be given a metal primer coat and two finish coats of A.S.A. No. 61 gray. Furnish sufficient paint for field touch up. A strippable plastic coat shall be provided over the finish coat before shipment, which shall be removed when the equipment is placed in service.

(d) Control Center; Detail Requirements - Control Building: The main control center shall be furnished and installed in accordance with one line diagrams and arrangement sketches shown on the drawings in the location indicated within the control building. It shall contain the following equipment for 3-wire, 480 volt, 3-phase, 60 cycle service, arranged "back to back" as indicated. Associated and lined up with it there shall be installed the control and instrument panels in all.

One - Horizontal 600 amp bus.

One - Incoming, molded case, manually operated, air circuit breaker, 600 amp, TPST, 480 volts, (35,000 asymetrical amps interrupting capacity), with interchangeable thermal and independent magnetic trip units, with magnetic trip element set at factory for tripping at 6000 amps instantaneous. Terminals for two 250 MCM cables per phase shall be provided.

One - Voltmeter with transfer switch, 600 volt scale (G.E. Type AB-18 or approved equal).

One - Ammeter, 500 amp scale, with transfer switch (G.E. Type AB-18 or approved equal).

Two - Current transformers, 600/5 amps.

One - Control power transformer with secondary fuses and connections to furnish the necessary control power for equipment connected to this center and the control board adjacent to it. Include control power fuses for each starter.

Six - Size 3, FVNR, starters for 480 volt, 3 phase raw sewage pump motors with interlocks as indicated, including one on each starter to control the water seal motor associated with each two pumps and necessary terminals for remote devices indicated in schematic control diagram.

Two - Spaces with vertical buses for future installation of Size 3 starter as above.

Three - Size 1 starters, 3 pole, 480 volts, for water seal pump motors with RED run light and H-O-A switch in door to provide for automatic starting when either of the associated raw sewage motors are started.

One - Space with bus for future water seal motor starter.

Two - Size 1 combination starters for grit tank blower motors with manual START-STOP buttons and RED run light in door.

One - Same as above for Dewatering Pump.

One - Size 0 starter, 3 pole, 480 volts, with RED run light, H-O-A switch in cover and terminals for NC limit switch on venturi meter for meter seal pump.

Three - Feeder breakers, 100 amp, 3 pole, 480 volts, F frame for circuits to (1) Head House, (2) lighting and small power transformer, (3) electric heaters and small air compressors.

One - Feeder breaker, 70 amp, to Hoist and Screen and Grit structure.

Two - Ditto, except 20 amp to Sewage Ejector and Final Settling Tank Motor.

One - Space with vertical buses for 225 amp, 3 pole, J frame breaker for deferred Recirculation Pumps.

One - Lighting and small power distribution panel Type NLAB, 120/208Y, 3 phase, 4 wire with lugs in mains.

See panel schedule on drawings.

(e) Digester Head House Control Center; Detail Requirements: There shall be installed in the Digester Head House a motor control center in accordance with the one line diagram, arrangement sketch and in the location indicated in the drawings. It shall contain the following equipment for 3 phase, 60 cycle, 480 volt operation. This equipment shall control digester heater panels, circulating pumps, sludge pumps and associated equipment. Digester heater panels, in addition to containing the heating control equipment, shall include starters, for the associated sludge recirculating pump motors. Such starters shall be for 440 volt motors with 110 volt contactor coils and with HOA switches in cover to provide for both manual and automatic operation of said recirculating pumps.

One - Incoming TPST, F frame, air circuit breaker, 100 amp, 480 volts, (15,000 amps IC) with thermal and independent magnetic trip.

One - Control power transformer, 480-120 volts, large enough to handle the control power for the two digester heater panels with their associated motors in addition to that required by equipment in this control center.

Two - Combination starters, air circuit breaker type, 480 volts, size 1, with thermal overload protection, for raw sludge pump motors, with RED run light, H-O-A switch and reset button on the door, with two interlocks and terminals for remote equipment indicated in schematic diagram.

Two - Program clocks, G.E. type TSA-40, with six sets of riders for an ON cycle of 15 to 30 minutes in any two hour period to control the above mentioned motors.

One - Combination starter same as above for water seal motor with RED run light, H-O-A switch and reset button on door with the indicated terminals.

Four - Feeder breakers, TPST, F frame, 30 amp, 480 volts, with thermal and independent magnetic trip.

One - Distribution panel board, type NLAB, 120/208Y volts, 3 phase, 4 wire, with solid lugs and incoming (only) master terminals. See panel schedule on drawings.

15.12 Main Building-Electrical Equipment External to Motor Control Center: The following items of electrical equipment (directly associated with the main control center, but external to it) shall be installed and connected to the load center as described below and/or as indicated in the drawings.

(a) Attached to beams or ceiling below control center:

One - General purpose dry type transformer, 3 phase, 60 cycle, 30 KVA, 480 - 120/208Y volts, with 4 (2½%) taps above and below 480. It shall be provided with knockouts for both high and low voltage conduits, and removable plates for easy access to terminal board with solderless connectors. (G.E. Cat. No. 9T23Y3522 or approved equal.)

One - Lightning Arrester, 3 pole, 480 volts, G.E. Cat. No. 9LA15B13.

One - Protective Capacitor, 3 pole, 480 volts, G.E. Cat. No. 21F830.

The above two items shall be mounted with suitable brackets where phase terminals can be connected to line terminals of incoming power breaker and ground terminals connected to main grounding system.

(b) On motor and pump floors:

Twelve - Remote SAFE-STOP-START control stations each consisting of a two position OPEN-CLOSED selector switch and a momentary contact START button of the oil tight construction in suitable condulet boxes mounted near the raw sewage motors and their pumps, so that workmen may interrupt the control circuit and also momentarily run the motor while the push button is held depressed.

(c) At Grit Removal Station: For control of the grit removal conveyor there shall be installed on a #10 gauge steel plate (galvanized after fabrication), located as indicated in drawings, the following devices:

One - Size 0 combination breaker type starter in NEMA 4 case (for the 3 phase 440 volt grit conveyor motor) with 110 volt coil and control transformer and an H-O-A switch in cover. A 1/4 HP 3 phase 440 volt vibrator motor (which cannot be overloaded) shall be connected to the conveyor motor terminals and thus simultaneously started by this starter.

One - Program clock, G.E. type TSA 40, with 6 sets of riders for an ON cycle of 15-30 minutes in any 2 hour period, with motor connected to above control transformer and contacts in the automatic side of above H-O-A. Provide sheet metal weatherproof enclosure.

One - Manually operated, 2 pole, CR-1062-M16A starter in NEMA 4 case with heater for control and protection of a 440 volt 440 watt heating coil.

One - Size 0 combination magnetic starter, 3 pole, 440 volt, with START-STOP buttons for 1/3 H.P. "SCREEN and GRIT FAN", "Lamacoid" or equal label, on cover, in NEMA 4 case.

(d) At Bar Screens: For the control of the bar screens there shall be installed a free standing angle iron frame work mounting a #10 gauge steel plate (all galvanized after fabrication) as located in the drawings and mounting the following equipment to be connected according to Screen Mfg's drawings.

Two - Size 0 combination breaker type magnetic starters, 3 pole, 480 volts, with 110 volt coils and control transformers, in NEMA 4 case, with H-O-A selector switch in cover and terminals and interlocks required.

* Four - Program clocks (furnished with Screen Mfg's equipment)

* Two - Clock Selector switches (furnished with Screen Mfg's equipment)

*Provide sheet metal weatherproof enclosure.

(e) At Final Settling Tank: For the control of the sludge collector motor there shall be installed the following pipe stand mounted equipment.

One - Size 0 combination breaker type magnetic starter, 3 pole, 480 volts, with 110 volt coils and control transformer, in NEMA 4 case, with START-STOP push button in cover and interlock for RED run light in main control building.

One - Reversing switch (CR 2960 Type SY-105-CD) wired directly in motor leads. Mount on pipe stand.

15.13 Digester Head House - Electrical Equipment External to Motor Control Center: The following items of electrical equipment (directly associated with the Head House control center, but external to it) shall be installed and connected to the load center as described below and/or as indicated in the drawings.

(a) Attached to Beams or Ceiling Below Control Center:

One - General purpose dry type transformer, 3 phase, 60 cycle, 9 KVA, 480 - 120/208Y volts, with 4 ($2\frac{1}{2}\%$) taps above and below 480. It shall be provided with knockouts for both high and low voltage conduits and removable plates for easy access to the terminal board. (G.E. Cat. No. 9T23Y 3033 or approved equal.)

One - Mechanically held lighting control contactor, 1 pole, 120 volts, 30 amp, for remote control of outdoor lighting at Primary Settling Tank, from momentary contact control switch at Main Control Building. The selected location must be accessible for inspection and maintenance.

(b) At Primary Settling Tank: For the control of the sludge collector motors and the remote control of Raw Sludge Pumps there shall be installed the following pipe stand mounted equipment.

Two - Size 0 combination breaker type magnetic starters, 3 pole, 480 volts, with 110 volt coils and control transformers, in NEMA 4

case, with START-STOP push button in cover and interlock for RED run light in Main Control Building.

Two - Reversing Switches (CR 2960 Type SY-105-CD) wired directly in motor leads. Mount on pipe stands.

Two - Outdoor, H-O-A oil tight, selector switches with RED run lights for remote control of Raw Sludge Motors in Digester Head House. Mount on pipe stands.

DIVISIONS ONE AND TWO

SECTION NO. 16

WATERPROOFING AND PAINTING

I. Waterproofing:

16.01 Scope: Apply waterproofing to the outside surfaces of all walls, top slabs and beams of dry pit areas, where such surfaces may come in contact with earth, sewage or sludge. Waterproofing of walls shall extend from, and include, the tops of footings to lines laid off accurately 6-inches below grade. Surfaces to be waterproofed shall include:

(a) Full height of the wet well side of the dry pit in the pumping station.

(b) Outside surfaces of walls of dry pit in pumping station, from six-inches below grade to top of footing or wet well top slab.

(c) Outside surfaces of walls of screen, grit and overflow structure from six-inches below grade to top of footings or to and including top of cover slab and beams carrying earth over entrance to the wet well of the pumping station.

(d) The inside wetted surfaces of walls of digesters which are common to and whose outside faces are exposed to digester head house areas, extending two feet laterally beyond head house walls.

(e) Outside surfaces of basement walls of digester head house from six-inches below grade to the tops of footings.

16.02 Surface Preparation: All uneven work, sharp corners, and projections shall be smoothed down. All defective surfaces showing aggregate or visible holes shall be cut out and painted with a special bonding coat equivalent to Isovol by Truscon Laboratories or similar Master Builders product. Over the completed surfacing apply a priming coat as specified later, or an approved ironite compound, Master Builders, Truscon or approved equal, in strict accordance with the manufacturer's printed specifications. Surfaces shall be thoroughly brushed and dampened before application. Between four and six coats shall be made until a chocolate brown color is obtained.

16.03 Materials: Surfaces described in (a), (b), (c), (d), and (e) shall be waterproofed with "Bituplastic" as manufactured by Koppers Company, Inc., Woodward, Alabama.

For surfaces which have been given an application of ironite, brush or spray clean water over an area of such size that it will remain damp while Bituplastic is applied. While the area is still damp, brush or spray two gallons of Bituplastic for each 50-60 square feet of surface to be coated. The emulsion shall be applied in at least two coats, but additional coats shall be used if necessary to secure a full 10-12 mils thickness as tested with an Elcometer. Apply additional materials until the above thickness is obtained.

At the Contractor's option, the ironite application may be omitted (except where necessary for patching) and a priming coat used if the concrete is thoroughly dry. Priming coat shall be one coat of Bitumastic Primer. In this case no water shall be used prior to using Bituplastic.

Brushes, if used, shall be soft bristle and must be soaked in water for at least two hours prior to use. For spraying, the emulsion should be passed through a 16 to 20 mesh screen. Rollers shall be as supplied by the manufacturer.

The first coat shall be applied so as to cover all surfaces to a uniform black color with no spreading or thinning out over portions which are too wet. Coating must not be applied during rainy weather which would make the emulsion wash off before oxidation. Each coat shall be allowed to dry thoroughly to a uniform flat color and shall be perfectly dry before application of succeeding coats or backfilling. Drying time will vary from an hour to several days, depending on temperature and humidity.

When high walls must be coated from different levels, the top of each coat must be carefully marked so that edges will overlap.

Second and third coats shall be applied to the dry surface without wetting down, with brush strokes running at right angles to those for previous coats.

"Bituplastic" shall be thoroughly stirred to brushing consistency before application without the use of thinners. The original containers shall be kept covered at all times except when removing materials for transfer to painting cans or spray tanks.

II. Painting:

16.04 Scope: Exterior painting shall include all outside wood and metal work for all buildings and equipment included in this contract. Exterior brick, tile and concrete will not be painted. Cast and wrought iron piping, fittings, and valves which are constantly submerged in sewage or buried in the ground will not be painted.

Aluminum will not be painted.

Interior painting shall include all interior wood and metal work, walls and ceilings of buildings, all piping, fittings, valves, equipment and metal work constructed under this contract, except as otherwise specified.

Walls and ceilings shall include dry pits or basements of raw sewage pumping station and control building, digester head house and screen and grit structure, including steps.

16.05 Material:

(a) All material shall be pure and of the best quality delivered in unbroken original containers, bearing the brand and manufacturer's name and shall be mixed in conformity with the manufacturer's specifications and directions. Thinners shall not be used in amounts exceeding labelled directions.

As far as possible paints shall be applied in alternating colors. For lighter shades use differing tones which will permit easy detection of voids or holidays.

(b) The painting schedule lists competitive brands of paint and other finishes acceptable for use in the work. This schedule is for identification as to type and quality of materials and shall be strictly

followed unless the Contractor submits an alternate schedule to the Engineer for approval. No substitution as to type of paint for any particular use will be approved.

Painting schedule shall be submitted in six copies.

All paint applied anywhere contrary to the specified or approved schedule shall be corrected as directed by the Engineer, all rejected paint removed from the job and repainting performed in strict accordance with the approved schedule and such other directions as deemed necessary by the Engineer.

(c) Paint by other manufacturers will be considered as an alternate for subjects 1 to 7 in the Painting Schedule, provided a complete line of types and colors with complete information as to composition and specifications is submitted soon after award of contract.

(d) Printed instructions of the paint manufacturer shall be submitted with schedules to the Engineer for approval. These instructions shall be filed on the job, explained in detail to all painters, and requirements strictly performed.

16.06 Identification Painting shall be provided for piping in buildings. Paint names and flow arrows on piping so as to be legible. Colored bands shall be painted on the edges of bells and flanges and at intermediate points on piping runs using the following colors:

Name on Pipe	Color Band
Feed	Green
Recirculation suction	Blue
Recirculation discharge	Orange and green
Supernatant	Brown
Sludge removal	Black
Gas	Red
Potable water	White
Building heating feed	Light Blue
Building heating return	Blue and Red
Air control piping	White and Red

PAINTING SCHEDULE

Subject	Paint Manufacturer and Trade Name	
	Inertol Co., Inc.	Amercoat Corporation
(1) Entrance floors to window sill height and basement walls to 4 foot height		
Priming - 1 coat	Ramuc Utility U'Coater	No. 86 Prime
Finish - 2 coats	Ramuc Utility Enamel	No. 33, brush or spray
(2) Upper walls and ceilings of entrance floors and basements		
Priming - 1 coat	Same as (1)	Same as (1)
Finish - 2 coats	Same as (1)	Same as (1)
(3) Metal Windows and Exterior Metal		
Priming - 1st coat	Primer No. 626	No. 86 Prime
Finish - 2 coat	Glamortex Enamel	No. 33, brush or spray
(4) Metal Doors, Frames, Trim (Factory Primed)		
Touch Up	Primer No. 626	No. 86 Prime
Finish - 2 coats	Glamortex Enamel	No. 50, brush or spray
(5) Galvanized Metal		
Priming - 1 coat	Primer No. 626	No. 86 Primer
Finish - 2 coats	Rigortex No. 5502 Aluminum	No. 33

Subject	Paint Manufacturer and Trade Name Inertol Co., Inc.	 Amercoat Corporation
(6) Int. Piping, Fittings, Valves, Stands, etc.		
2 seal coats (over coated pipe)	Ramuc Tar & Asphalt Sealer	Sand blast to grey metal
Priming - 1 coat	Ramuc Utility Enamel	No. 86 Prime
Finish - 1 coat	Ramuc Utility Enamel	No. 33
(7) Machinery & Equipment		
Priming	Primer No. 626	No. 86 Prime
Finish - 2 coats (outdoors)	Rigortex No. 5502 Aluminum	No. 33
F Finish - 2 coats (indoors)	Machinery Enamel	No. 50 or 33

Coatings Requiring Special Cleaning and Supervision by Paint Manufacturer

	Koppers Co., Inc.	Amercoat Corporation
*(8) Equipment and metal submerged in or subject to splash from sewage	2 coats Bitumastic Super-Service Black, at least 22 mils thickness; plus 1 coat Bituplastic 28, 10 mils minimum	1 coat No. 23 Primer, brush 3 coats No. 23 Body, spray 3 coats No. 33 Seal, spray to 16 mils minimum total thickness
**(9) Equipment and metal submerged in sludge or in contact with sludge gas, or buried in ground.	70-B Priming solution and enamel; 1/16" minimum 1/8" maximum thickness	

*Includes bar screen, grit, sludge collector equipment, interior of housings for above, weirs, top side of floating covers under roof, slide gates and frames below operating floor; does not include C.I. piping in sewage or ground, collector chains, sprocket teeth.

**Includes floating cover, rims, ceiling plates, gas dome interior, pipe ties and clamps.

16.07 Workmanship: All painting shall be done in first-class workmanlike manner. No painting shall be performed upon damp or frosty surfaces, or in wet foggy or freezing weather. No material painted inside shall be carried outside in wet or freezing weather until it is thoroughly dry. Any painting found defective shall be removed and repainted.

All surfaces shall be thoroughly brushed and cleaned off before being painted, and shall be perfectly clean and dry where paint is applied. In the case of iron, steel and metal work generally, all abrasions in the priming coat shall be carefully wire brushed and sandpapered smooth, removing all scales, ridges or paint skins, and the surfaces shall then be painted the requisite number of coats herein specified.

Before iron or steel is painted, all voids, open or hollow places and irregularities shall be filled with a mixture suitable for the material and purpose. Paint shall be evenly spread and well brushed out so that there shall be no drops, runs or sagging of materials.

Drop cloths shall be used where necessary to prevent paint or other material from defacing the structures or equipment in place and upon completion of the work, all paint spots shall be removed from all surfaces.

16.08 Preparation of Painting Surfaces: All surfaces to be painted shall be prepared in accordance with the best practice with particular attention to the following:

1 and 2. Interior Walls and Ceilings: Neutralize with acid and wash thoroughly before painting. Paint the lower four feet of walls and dado stripe in darker colors than upper walls and ceilings.

3 and 4. Metal Windows, Doors, Etc.: Remove all rust and loose scale with wire brush and wipe clean. Caulk around frames and trim, allow to set, then smooth up for primer coat.

5. Galvanized Work: Except for "Amercoat", neutralize with a solution of 8 oz. copper sulphate per gallon of water, rinse with clean water and allow to dry. Rinsing shall be done immediately after the galvanizing is visibly darkened. For "Amercoat" use their No. 59 only; copper sulphate cannot be used.

6. Coated Piping: If the "Inertol" seal coat specified for piping which has a bituminous coating is insufficient to protect the priming coat, the sealing process shall be repeated until a satisfactory primed surface is obtained. For "Amercoat" remove bituminous coating by sand blasting to grey metal. Clean black pipe by "brush-off" sandblasting.

7. Machinery and Equipment: Use special care to leave all name plates and non-ferrous finished trim unpainted. Complete instructions as to equipment requiring painting shall be obtained from the Engineer before starting the work. Control centers, meter panels, chlorinators shall not be painted in field.

(NOTE: Coatings of Koppers 70B enamel in the following shall be applied by crews approved by the manufacturer.)

8 and 10. Equipment and metal submerged in Water or Sewage: All traces of rust, scale and other foreign matter shall be removed by sand blasting

to uniform gray-white metal. After cleaning dust from sand blasted surfaces, priming coats shall be applied immediately. Surfaces left unprimed overnight shall be sand blasted on the following day to obtain the same gray-white surface.

9. Equipment and Metal Submerged in Sludge: Floating covers and digester appurtenances shall be cleaned by sand blasting in the same manner as prescribed above for subject 8.

Prior to cleaning the floating covers shall have been tested by water and compressed air by the manufacturer's representative in the presence of the Engineer, all leaks rewelded and the cover retested.

The covers shall be lifted above the tank walls for cleaning and painting. During all painting work the digester shall be emptied of water and kept as dry as practicable to avoid excess humidity.

16.09 Paint Application: Printed instructions of the paint manufacturer as provided for in 16.05(d), together with these specifications shall be made available to the painting foreman, explained to all painters, and strictly followed.

16.10 Testing Paint Coatings: All coatings applied under subjects 8 and 9 shall be tested for holidays and thicknesses.

70-B enamel coatings shall pass a holiday detector test at 8000-10,000 volts, using equipment and methods approved by the Engineers. Procedure will also be established for detector tests of Super-Service Black. The thickness of coal tar coatings will be determined by prick gauge.

Equipment for testing shall be supplied by the painting manufacturer but will be tested as required by the Engineer.

DIVISION TWO

SECTION NO. 17

SEWERS AND APPURTENANCES

17.01 Work to be Done: The Contractor shall furnish the material and construct the sewers, shown on the plans, together with all clearing, grubbing, excavating, sheathing, backfilling, foundations, manholes, and other appurtenances, as shown on the plans or specified. The work shall include all ditching, diking, pumping, bailing, draining, flushing and testing, and all provisions necessary to protect and maintain buildings, fences, water and gas pipes, drain culverts, power and telephone lines and cables, and other structures, the furnishing and maintenance of suitable bridges and footways across intercepted streets and alleys, the replacing of pavements and sidewalks, the cleaning away of all rubbish and surplus materials, and the furnishing of all materials, tools, implements and labor required to build and put in complete working order the specified sewers and all structures appertaining thereto.

17.02 Location and Grade: The line and grade of the sewer and the position of all manholes and other appurtenances will be given by the Engineer. The grade line as given on the profile or mentioned in these specifications means the invert, or bottom of the inside of the pipe, and the price for trenching, shall include the trench for the depth below this line necessary to lay the sewer to this grade, but measurements for payment will be made only to the grade line.

All necessary lines, levels and grades will be given by the Engineer, but the Contractor shall provide such field men and assistants as the Engineer may request, and such planks, stakes, spikes, nails and other fastenings and necessary assistance as may be required for giving same.

17.03 Order and Location of Work: The Owner reserves the right to accept and use any portion of the work whenever it is considered to the public interest to do so, the Engineer shall have the power to direct on what line or street the Contractor shall work and the order thereof. In general, the work shall be from the outlet to the mains and thence to the laterals.

17.04 Street Crossings, Etc.: At such crossings, and other points as may be directed by the Engineer, the trenches shall be bridged in an open and secure manner, so as to prevent any serious interruption of travel upon the roadway and sidewalks, and also to afford necessary access to public or private premises.

The material used, and the mode of constructing said bridges, and the approaches thereto, must be satisfactory to the Engineer. The cost of all such work must be included in the price bid per lineal foot for the pipe.

17.05 Protection of Other Utilities and Structures: Any damage done to existing utility lines, services, poles and structures of every nature shall be repaired or replaced by the Contractor at his own expense. The approximate position of certain known underground lines are shown on the plans for information. Existing small lines are now shown. The Contractor shall locate these and other possible unknown utility lines by use of an electronic pipe finder; and shall excavate and expose all existing underground lines in advance of trenching operations.

Removing and relaying of such lines and appurtenances which constitute an obstruction to the completed line and grade of the new work, in the opinion of

the Engineer, will be made at the expense of the Owner, unless otherwise shown on plans to be altered by the Contractor.

At locations where the sewer is to be constructed adjacent or under railroad tracks, the Contractor shall take all precautions, and comply with all requirements, as may be necessary to protect the improvements and services of the respective railroad companies. At track crossings the sewer will be constructed as called for on the plans and provided for herein.

17.06 Inspection: All work done and materials furnished shall be subject to the inspection of the Engineer and the Inspector, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer of the rejection of such materials. And the Engineer shall have the right to so mark rejected materials as to distinguish them as such.

17.07 Sewer Pipe: Vitrified clay pipe for sewers shall be bell and spigot type and shall be furnished in lengths of at least four feet. Concrete pipe for sewers shall have "O-ring" rubber gasket type joints and shall be furnished in lengths of at least eight feet.

Alternate bids are required for sewers thirty (30) inch and smaller on both concrete pipe and vitrified clay pipe. Concrete pipe shall be used for sewers thirty-six (36) inch and larger.

The manufacturer of the pipe shall submit evidence of having consistently produced pipe of satisfactory quality and performance results in service over a period of at least two years. All pipe shall be tested by an approved testing laboratory and stamped as specified under Section No. 2 herein.

All pipes shall be first quality, of smooth exterior and interior surfaces, free from cracks, flaws, blisters and other imperfections, true to their theoretical forms throughout their length. All work done and materials furnished shall be subject to the inspection of the Engineer, and all improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received of the rejection of such materials.

Except as otherwise specified herein all pipe shall conform to the respective A.S.T.M. Standard Specifications as follows:

Standard Strength Sewer Pipe

(a) A.S.T.M. Designation C13-54 - for clay pipes sizes 6-inch through 30-inch
(b) A.S.T.M. Designation C14-55 - for non-reinforced concrete pipe sizes 15-inch and smaller
(c) A.S.T.M. Designation C75-55 - for reinforced concrete pipe sizes 18-inch through 30-inch
(d) A.S.T.M. Designation C76-55, Table One - for reinforced concrete pipe sizes 36-inch through 54-inch

Extra Strength Sewer Pipe

(a) A.S.T.M. Designation C200-55T - for clay pipe sizes 6-inch through 30-inch
(b) A.S.T.M. Designation C76-55, Table One - for reinforced concrete pipe sizes 21-inch and smaller

(c) A.S.T.M. Designation C76-55, Table - for reinforced concrete pipe
Two sizes 24-inch through 54-inch

All sewer pipe when tested by the 3-edge bearing method in accordance with the standard specifications designated shall have a minimum strength of not less than the following values:

	Minimum Strength, Lbs. per Lin. Ft.	
Interior Diameter	Standard Strength Pipe	Extra Strength Pipe
8"	1300	2000
10"	1400	2000
12"	1500	2250
15"	1750	2625
18"	2000	3000
21"	2200	3300
24"	2400	4000
30"	3200	5000
36"	3900	6000
42"	4725	7000
48"	5400	8000
54"	5850	9000

The minimum strengths tabulated above are defined as the crushing strength of clay pipe and non-reinforced concrete pipe, and as the load to produce a 0.01-inch crack in reinforced concrete pipe.

Standard strength sewer pipe shall be used for all lines not otherwise specified. At locations where called for on the plans, or where ordered by the Engineer, account of anticipated excessive loads from future filling, extra strength pipe shall be used for sewers. Extra strength sewer pipe may also be used at Contractor's option as provided for in paragraph 17-19 (A-1) of this section.

Bell ends for clay sewer pipe having bell and spigot type joints shall be of such design as will permit effective connecting for watertight construction. Dimensions of bells of clay pipe shall conform to the Standard Specifications.

"O-Ring" rubber gasket type joints for concrete sewer pipe shall generally conform with applicable provisions of A.S.T.M. Designation C361-55T for Low-Head Pressure Pipe. The joint assemblies shall consist either (1) of steel bell and spigot rings, or (2) of all concrete bell and spigot joints, or (3) of joint utilization collars in lieu of bells for spigot end pipe, each with circular rubber ring gaskets as the sole element utilized in sealing the joint. A rectangular groove shall be provided in the spigot end to receive the rubber gasket and the joint assemblies shall be so formed and accurately manufactured as to provide a close sliding fit with the rubber gasket confined on all four sides. All exposed surfaces of steel bell and spigot rings shall be protected by a coating of zinc applied by an approved metallizing process. Joint utilization collars under (3) above shall be accurately formed sleeves consisting of catalyzed and heat reacted epoxy resin reinforced with high tensile strength fiberglass roving and fabric, similar and the approved equal in formulation and manufacture to "Amband" glass-resin coupling made by the American-Marietta Company, Chicago, Illinois. Wall thickness, steel reinforcement and minimum strength of the pipe barrel shall conform to the provisions heretofore for reinforced concrete sewer pipe.

17.08 Metal Pipe: Cast iron pipe materials for sewers shall conform to provisions of Section No. 7 heretofore.

17.09 Jointing Compound: Clay sewer pipe with bell and spigot type joints shall be laid with hot poured plastic joints, except as otherwise specified for pipe laid in wet trenches or under wet conditions. Plastic jointing compound shall be a filled hydrocarbon plastic shall adhere firmly to the surface of the pipes, shall melt and run freely at a temperature of four hundred and thirty (430) degrees F., and when set shall be sufficiently elastic to permit of a slight movement of the pipes without injury to the joints, or breaking the adhesion of the compound to the pipes. The compound shall not deteriorate when submerged in fresh or salt water or normal domestic sewage. It shall show no deterioration of any kind when immersed for a period of sixty (60) days in a five per cent solution of each of the following compounds: H_2SO_4, NaOH, KOH, and NaOCl. The plastic compound shall be JC-60 compound as manufactured by The Atlas Mineral Products Company of Mertztown, Pennsylvania, or approved equal. Priming solution shall be used for all types of sewer pipe and shall be applied to both the exterior surface of the spigot and the inside of the bell at least one day before pipe is laid. Priming solution shall be Atlas No. 60 Primer, or approved equal.

17.10 Concrete and Mortar: Concrete of the respective classes for structures, manhole bottoms and bedding shall conform to all provisions of Section No. 4 of these specifications.

Cement mortar for brick work and inverts of manholes shall be made of one part cement and two parts clean sharp sand. Cement shall be 75% Portland and 25% Puzzolan.

17.11 Reinforcing Steel and Miscellaneous Metal: Materials, fabrication and installation of reinforcing steel, manhole frames and covers, railing and other miscellaneous metal shall be as provided for in Section No. 5 and in accordance with details shown on the plans.

17.12 Excavation: Perform all excavation of every description and of whatever substances encountered to the depth shown on the plans or specified for all sewers, manholes, piers, conduits and other appurtenances.

All excavation shall be made by open cut unless otherwise directed. Tunneling shall be done as specified. The tunnel height, width, and cross section shall be as approved by the Engineer.

The top portion of sewer pipe trenches may be excavated with sloping or vertical sides to any width which will not cause damage to adjoining structures, roadways, pavements, utilities or private property. For untimbered trenches or trenches held by stay bracing only, the width of the lower portion of the trench to a height of two feet above the top of the pipe shall not exceed maximum trench widths specified for the respective size pipes in paragraph 17.19 following. The width of trenches where skeleton or solid sheeting is used may be increased to dimensions approved by the Engineer, but not greater than necessary to clear the walers when lowering pipes into the trench.

If trenches are excavated to widths in excess of the above limitations, or collapse because of insufficient bracing and sheeting, the Contractor will be required to use special methods of constructing pipe foundations and backfilling as specified herein at his own expense.

Trench excavation shall not advance more than six hundred feet ahead of pipe laying unless permitted by the Engineer because of wet ground or probable delay in making deep excavations.

The bottom of all trenches, except as otherwise specified shall be rounded to conform to the bottom of the pipe so as to afford full bearing on the pipe barrel. The depth and width required for such shaping shall be directed by the Engineer.

Excavation in excess of depth required for proper shaping shall be corrected by one of the special methods specified herein, as ordered by the Engineer. Bell holes shall be excavated so as to relieve pipe bells of all load, but small enough to insure that support is provided throughout the length of the pipe barrel.

Excavation in excess of the depths required for manholes and other structures shall be corrected by pouring a sub-foundation of Class "C" concrete at the Contractor's expense.

17.13 Excavation in Solid Rock: Solid rock shall consist of such materials in the original bed or well defined ledges which in the opinion of the Engineer cannot be removed with pick and shovel, ditching machine, back-hoe, or other similar devices, and which requires drilling and blasting, or the use of jack hammers or bullpoints. Concrete and masonry structures that require drilling and blasting for removal shall be considered as rock unless otherwise provided for herein. Boulders or detached pieces of rock having volumes of more than 8 cubic feet shall also be considered as rock.

Ledge rock, boulders, and large stones shall be removed to provide a clearance of not less than 6 inches in any horizontal direction from all parts of pipe, fittings, and other appurtenances.

Where rock excavation is encountered at grade in trenches, the trench shall be excavated not less than 4 inches below the bottom of the pipe bell refilled with gravel or crushed stone, thoroughly tamped in place, and shaped to the pipe as heretofore specified. No payment in addition to prices paid for sewers will be made for gravel or stone bedding above specified.

Excavated rock shall not be mixed with material selected for tamped backfilling under and around the pipe up to a level at least two feet above the pipe.

Where sewers are constructed across cultivated fields and pastures, or in streets, excavated rock shall not be mixed with backfill material used to complete the final 12-inch layer of backfill at the original ground surface. Surplus rock shall be removed and wasted at points designated by the Owner.

Excavation in solid rock will be paid for at the unit price of ten ($10.00) Dollars per cubic yard as stated in the Proposal, such price to be in addition to that paid per foot of sewer for the various depths encountered. The Engineer must be given ample notice to measure all rock after it has been stripped and before it is blasted. No payment will be made for any rock blasted before such measurement is made. Rock excavation will be measured for payment for a width equal to the outside diameter of the pipe bell plus 12 inches, the sides of the trench being considered vertical, and to a depth of 4 inches below the bell of the pipe laid on the grade established by the Engineer. Measurement for payment for rock excavation at manholes and other miscellaneous structures will be made to lines which are not more than 6 inches outside neat footing lines.

17.14 Blasting: Blasting operations shall be conducted in strict accordance with all existing ordinances and regulations, and shall be done only after the Engineer's approval of the method and quantity of explosive to be used. All exposed structures shall be carefully protected from the effects of blast and all blasts shall be covered with heavy timbers or other suitable material. The blasting shall be done only by experienced men. Any damage done shall be promptly repaired by the Contractor at his own expense. All blasting supplies shall be stored in a manner approved by the Engineer, and a watchman shall be stationed at all times at the place of storage.

No blasting will be permitted adjacent to existing buildings or structures. All rock at such locations shall be removed by use of jack hammers and bull-points.

17.15 Dewatering Trenches: All excavation shall be dewatered properly before laying pipe. Where running sand is encountered, dewatering shall be done by well pointing whenever possible. Where soil conditions are not favorable for use of well point, french drains of crushed stone or gravel shall be constructed to suitably located sumps and the water removed by bailing or pumping. All costs of equipment, labor and materials required for dewatering shall be included in the prices bid for sewers.

17.16 Crushed Stone Fill: Wherever the subgrade is by nature too soft or mucky, in the opinion of the Engineer, for the proper installation of the sewer, he may order the Contractor to undercut the ditch and backfill with crushed stone or gravel, 3/4" in size and less. The stone so placed shall be brought to grade and compacted. Payment for crushed stone backfill, only where ordered by the Engineer, will be made at the price bid per cu. yd., measured before placing, and shall include the removal of unsuitable subgrade materials.

17.17 Bracing and Sheeting: The sides of all trenches and excavation for sewers and structures shall be securely held by stay bracing, or by skeleton or solid sheeting and bracing, as required by the soil conditions encountered, unless otherwise permitted by the Engineer.

Bracing and sheeting may be removed in units when the level of the backfilling has reached the elevation necessary to protect the pipe work and adjacent property. Sheeting near the bottom of trenches over ten feet deep, for sewers 15-inch size and larger, shall remain in place and shall be cut off not less than two feet above the top of the completed sewer. When, in the opinion of the Engineer, sheeting or shoring above this level cannot be safely removed, it shall be left in place and the Contractor will be paid for the sheeting or shoring so left in place at the prices bid. Sheeting so ordered to be left in place shall be cut off at least two feet below the surface. No lumber for shoring or bracing exceeding that size customarily used, will be paid for unless the use of larger sizes shall have been ordered in writing by the Engineer.

17.18 Backfilling: All trenches and excavation shall be backfilled immediately after the pipes are laid therein, unless other protection of the pipe line is directed. The backfilling material shall be selected and deposited with special reference to the future safety of the pipes. Except where special methods of bedding and tamping are provided for, clean earth, sand or rock dust shall be solidly tamped about the pipe up to a level at least two (2') feet above the top of the pipes, and shall be carefully deposited in uniform layers, each layer solidly tamped or rammed with proper tools so as not to injure or disturb the pipe line. The remainder of the backfilling of the trench shall be carried on simultaneously on both sides of the pipes in such a manner that injurious

side pressures do not occur. After placing the backfill up to a level slightly below the natural ground surface, surplus excavation shall be windrowed and maintained in a suitable manner to concentrate and pond surface run-off from rains over the trench; after sufficient settlement has been obtained, in the opinion of the Engineer, the Contractor shall complete the dressing, removal of surplus materials and surface clean-up in accordance with these specifications. Backfilling across roads and streets shall be as specified for replacing of pavement.

Walking or working on the completed pipe sewers, except as may be necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a height of at least two (2') feet over the top of the pipes.

Whenever the trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed off and finally made to conform to the surface of the ground. Backfilling shall be carefully performed and the original surface restored to the full satisfaction of the Engineer. Backfill in open trenches across sidewalks and roadways shall be made as above specified, except that fill above pipes shall be deposited in layers not to exceed 6 inches and thoroughly compacted as provided elsewhere in these specifications. Surplus material shall be disposed of as directed by the Engineer.

17.19 Special Bedding and Tamping: Special methods of shaping the pipe foundation, bedding and tamping will be required for 8, 10 and 12-inch sewers in cuts exceeding six (6') feet and for all sewers 15-inch and larger in all depths of cut, as follows:

A. Special concrete bedding shall consist of Class "C" concrete. The trench shall be excavated to a depth of one-fourth the nominal diameter of the pipe below pipe grade and the pipe laid to line and grade on concrete blocking. Concrete shall then be poured to the full width of the trench to a height of one-fourth the nominal diameter of the pipe above the invert.

A-1. (Condition 1). In lieu of special concrete bedding as above, the Contractor may elect to furnish and install extra strength sewer pipe, laid with special earth bedding and tamping methods as described under "B" following.

(Condition 2). At locations where the trench depths exceed the specified maximum allowable depths using standard strength pipe and special concrete bedding, for sewers 21-inch and larger, extra strength sewer pipe shall be laid with special earth bedding and tamping methods as described under "B" following.

B. Special earth bedding shall be performed by first shaping the bottom of the trench to a level slightly lower than the bottom of the pipe. The pipe bed shall then be brought to the proper level by spreading and thoroughly tamping a layer of fine granulated, moist earth and sand so as to conform accurately to one-fourth the circumference of the pipe barrel. If suitable granulated materials are not available from trench excavation, the Contractor will be required to obtain them elsewhere.

After laying the pipe, sheeting and bracing shall be withdrawn or cut off as specified, the trench shall then be backfilled and hand tamped with thin layers of the same selected material to a height of three-fourths the diameter of the pipe. The balance of the trench shall then be backfilled as specified previously. Trenches excavated to excess depths shall be brought to proper grade by bedding with stone or gravel at the Contractor's expense. First class workmanship and careful inspection to avoid disturbing pipe grade, alignment and joints must be exercised at all times.

C. Trenches for which a shaped bottom is required shall be trimmed by hand to conform accurately to the lower part of the pipe barrel for at least one-fourth its circumference. If this shaping cannot be performed accurately, special earth bedding and tamping shall be required as specified under paragraph "B" above.

D. Flat bottom trenches will not be permitted anywhere for sewers 15-inch and larger at any depth of cut. Sewers up to 12-inch size may be laid in flat bottom trenches for depths of cut not in excess of 6 feet. Tamping shall be performed as specified under paragraph "B".

Maximum trench depths for various bedding methods, for pipe of the strength shown, are given in the table below.

Maximum Trench Depths For Various Bedding Methods		Bedding Method				
		Standard Strength Pipe				Extra Str. Pipe
		D	C	B	A	A-1
Size Pipe	Maximum Trench Width	Flat Bottom Trench	Shaped Bottom Trench	Special Earth Bedding	Special Concrete Bedding	Special Earth Bedding
8"	2'-2"	6	12	16	30	30
10"	2'-4"	6	11	16	30	30
12"	2'-6"	6	10	15	30	30
15"	2'-10"	None	10	14	28	28
18"	3'-2"	"	10	14	24	24
21"	3'-6"	"	10	13	22	24
24"	3'-10"	"	10	13	21	24
30"	4'-7"	"	10	13	21	24
36"	5'-5"	"	10	13	21	24
42"	6'-1"	"	12	15	22	24
48"	6'-9"	"	13	16	22	24
54"	7'-6"	"	13	16	22	24

Sewer Pipe which does not conform to the table in paragraph 17.07 herein as to strength, but whose test strength is not less than 90 per cent of the tabulated values, may be acceptable by special permission from the Engineer. Flat bottom trenches shall not be used for any size sewer pipe with a low test of strength.

If trenches are excavated to widths in excess of those specified or trench walls collapse, sewers shall be laid in accordance with the requirements for at least the next better class of bedding, at the expense of the Contractor, as directed by the Engineer.

The cost of special bedding and tamping shall be included in the prices bid for

sewers at various depths, except that the Engineer may authorize payment for concrete bedding or the use of crushed stone bedding where poor soil conditions are encountered, each in accordance with unit prices bid. Under special bedding method "A-1", the cost of furnishing extra strength sewer pipe for condition 1 and condition 2 shall be included in the prices bid for sewers at various depths.

17.20 Laying Pipe: All sewer pipe shall be laid up grade with the spigots pointing down grade. The pipe and specials shall be so laid in the trench that after the sewer is completed the interior surface shall conform on the bottom accurately to the grades and alignment fixed or given by the Engineer.

Clay Sewer Pipe with Bell and Spigot Type Joints

Before lowering the pipe and specials, each pipe must be fitted into the socket it is intended to enter, and the top of each piece shall be plainly marked with chalk or paint and the marked point is to be placed uppermost in the sewer.

Space between the pipe and socket is to be made as uniform as possible. A gasket of dry jute shall be properly caulked into each joint to sufficient depth to expose the grooves in the pipe outside the caulking material and the joint thoroughly filled with hot poured plastic joint compound. Tarred gaskets must not be used. The methods employed in pouring compound shall be exactly in accordance with the manufacturer's instructions.

No joints shall be poured where surfaces of pipe and bell to be joined have been soiled by earth in handling until such soiled surfaces are so thoroughly cleaned by wire brushing and wiping that all traces of the earth are removed.

No plastic joints shall be poured where water or moisture is present and the pipe is not kept clean and dry.

No joint shall be poured until the next succeeding joint shall have been gasketed and caulked. All joint material that may be left on the inside shall be thoroughly cleaned out and the pipe left clean and smooth throughout. Every third pipe shall be filled around immediately after being properly placed and caulked to prevent the moving of joints.

The interior of the pipe shall be carefully freed of all dirt and superfluous material of every description, as the work proceeds.

A filled bag or other approved type of follower shall be used and shall be pulled through the line immediately after each joint is made in order to remove any mortar or debris which may be left on the inside of the pipe. If a bag type follower is used, a new one shall be provided and used daily.

Defective joints discovered after laying shall be repaired and made tight. Defective pipes shall be removed and proper replacement made. All openings shall be closed with an approved type vitrified clay or concrete plug held in place with material such as specified for filling joints. Dead ends of sewer lines shall be similarly stoppered.

Concrete Sewer Pipe With "O-Ring" Rubber Gasket Type Joints

The surfaces of pipe to be joined as well as the rubber gaskets shall be cleaned and lubricated with a vegetable soap to permit uniform placement in

accordance with the manufacturer's written instructions. After each joint is installed the gasket shall be checked for proper position in the grooves prior to installation of the succeeding length of pipe.

The external and internal recesses at each joint shall be filled with cement mortar wherever such construction is recommended by the manufacturer.

Any temporary blocking used to facilitate installation of the pipe shall be removed and selected material shall be tamped in the void left by the blocks.

The interior of the pipe shall be carefully freed of all dirt and superfluous material of every description, as the work proceeds.

Defective joints discovered after laying shall be repaired and made tight. Defective pipes shall be removed and proper replacements made.

17.21 Joints Made Under Wet Conditions: Wherever wet ditches are encountered or where pipe joints cannot be kept dry until poured, one cement "diaper" joint and one plastic joint may be used alternately in joining clay sewer pipe with bell and spigot type joints. Two pieces of pipe shall first be jointed with plastic jointing compound before being placed in the trench. Suitable templates and slings shall be employed to assure proper alignment of the pair of pipes during the pouring of the plastic joint and the lowering of pipes into place in the trench. Each pair of pipes shall then be joined to the sewer line with a poured cement diaper joint as specified following.

After caulking with jute or oakum, the pipe bell and a short section of pipe barrel ahead of the joint shall first be encircled with a heavy two-ply muslin envelope or "diaper" stitched along each edge and provided with tie wires of bailing wire inserted in the stitched edges in draw string fashion. The "diaper" shall be of such length as to extend around the pipe barrel, leaving sufficient opening at the top for pouring. The wires shall be tightly drawn and the envelope firmly secured against pipe bell and barrel. Through the opening in the envelope at the top, or at the sides for large pipe, the joint shall then be completely filled with Portland cement mortar, made of equal parts of cement and sand, thoroughly mixed dry, then mixed with water in which an approved waterproofing compound has first been dissolved in such ratio as to provide seven (7) pounds of waterproofing compound per cubic yard of mortar. The compound used shall be a metallic soap type, having ammonia as a dispersing agent. Highly concentrated types of compound will not be permitted. The waterproofing compounds shall be as manufactured by Truscon Laboratories, Master Builders, or approved equal. Sufficient water with the dissolved waterproofing compound shall be added so that the mortar flows freely into and entirely fills the joint space. Mortar shall be pressed firmly into the joint with the hands after access water has drained out. The "diaper" shall be left in place and the surface shall be left smooth and concentric with the pipe barrel. After the joints have hardened the tops of all joints shall be pointed up with cement mortar mixed same as above but only wet enough for workability.

The prime coat specified for plastic joints shall not be applied to the bell and spigot surface of the cement "diaper" joint.

For 30-inch clay pipe sewers laid in wet trenches, the alternate plastic joints may be omitted at the option of the Contractor and the poured cement "diaper" joints used exclusively provided that one plastic joint be installed at intervals not to exceed 75 feet.

17.22 Connections to Existing Sanitary Sewers: At locations where new sewers are to be connected to existing sanitary sewers, the Contractor shall first expose the existing sewer and install a supporting timber beam with suitable straps around the existing pipe so as to bridge the excavation for the new manhole. The manhole shall then be constructed complete with invert and cover while the existing sewer is maintained in service. The Contractor shall construct temporary diversion sewers at locations shown on the plans, and he shall make connections to the existing sewers after final inspection of all work.

Extra costs for complying with the above requirements shall be included in the unit prices bid for sewers.

17.23 C.I. Pipe Constructed in Tunnel: Where the plans call for sewer lines of cast iron pipe to be constructed in tunnels, the Contractor shall construct a tunnel of suitable height and width to permit the installation of the sewer pipe. The grade at the bottom of the tunnel shall conform to the sewer grade to afford full bearing for the pipe barrel as provided for in specifications for open trench construction. Timber lining and/or bracing shall be installed as required by the nature of the soil to obtain safe working conditions and to protect existing improvements. The tunnel height and width and type of tunnel bracing and lining shall be subject to the approval of the Engineer.

The cast iron pipe sewer shall be laid true to line and grade and shall be properly bedded, and the tunnel shall be backfilled full length and depth with pit run sand or stone screenings. Thorough compaction of the backfill shall be accomplished by hydraulic methods. Tunnels shall be sealed with brick or concrete walls at each end.

In addition to complying with the requirements of these specifications, the Contractor shall ascertain and comply with the requirements of the Highway Department, where applicable, for the protection of the improvements and services at the crossing.

The lump sum price bid for installing cast iron pipe in tunnels shall include all costs of materials, labor and equipment required to construct the item complete in place and accepted. The price bid shall also include such items as rock excavation and any other item of construction necessary to complete the work to the satisfaction of the Engineer.

17.24 Road Crossings: At locations where sewers are constructed across roads, crossings shall be installed by open trench methods. Pipe materials, sheeting and special concrete bedding shall conform to requirements shown on the plans at the respective locations. All work will be measured and payment made therefor as specified for sewers and any additional costs of highway protective services shall be included in the unit price bid for sewers.

17.25 Closing Pipe: When the work of pipe laying is suspended, either for night or at other times, the end of the sewer must be closed with a tight cover. The Contractor will be held responsible for keeping the sewer free from obstruction.

17.26 Leakage: The allowable limit of the leakage of ground water into sewers shall not exceed the following rates of infiltration:

(a) 0.25 gallons per inch diameter per foot of pipe per day for any stretch of sewer between adjoining manholes.

(b) 0.15 gallons per inch diameter per foot of pipe per day for any sewer, or system of sewers, one mile or less in length.

(c) 0.10 gallons per inch diameter per foot of pipe per day for any trunk sewer, or sewer system, the total length of which is greater than one mile.

Leakage tests shall be made only when the ground water table is above the top of the sewer pipe and after all visible leaks have been stopped. In case the leakage exceeds the rates above specified, the sewer shall not be accepted until so repaired that it will comply with these requirements.

17.27 Testing and Cleaning: Before acceptance of the sewer system, same shall be tested and cleaned to the satisfaction of the Engineer. Where any obstruction is met, the Contractor will be required to clean the sewers by means of rods or swabs or other instruments. The pipe line shall be straight and show a uniform grade between the manholes.

17.28 Manholes: Manholes shall be constructed at such points as may be designated according to plans and directions given. In all cases the channel shall be smooth and properly rounded. Special care must be exercised in laying the channel and adjacent pipes to grade. The connection of the sewer with the wall and channel of the manholes shall be tight and smooth.

The first length of pipe for future lateral sewers of such size as may be designated, shall be inserted and laid to proper grade alignment. The stub end shall be plugged as specified under "Laying Pipe". All costs for furnishing and laying this pipe will be included under unit prices bid for manholes.

The top of manholes outside of roads, streets and highways shall be built to grades 12 inches above ground surface unless otherwise shown on the plans. Manholes in roads, etc., shall be built to grades designated by the Engineer.

The bottom of each standard brick manhole shall be built of Class "B" concrete and the walls of the manhole shall be built of whole hard burned brick of good quality laid in cement mortar made of one part cement and two parts clean sharp sand. Cement shall be 75% Portland and 25% Puzzolan. Immediately before laying, the brick shall be thoroughly saturated with water. Every brick shall be carefully imbedded in mortar on its bottom and sides, and the walls shall be thoroughly plastered on the outside with a smooth coat of 1:2 cement mortar.

Reinforced concrete slabs for other manholes shall be built of Class "A" concrete in accordance with typical details shown on the drawings.

Brick drop manholes shall be built at locations shown on the plans or as directed by the Engineer, and shall conform to details shown on the plans.

Manhole frames, covers and steps shall be as shown on the plans.

17.29 Piers and Other Structures: All piers and other appurtenances shall be constructed as shown on the plans.

(a) Piers for cast iron pipe sewers shall be constructed in accordance with details shown for the various type piers. The pipe shall be blocked to the proper grade and then grouted in place. Pipe straps shall be installed on all piers. Measurement of heights for payment for

piers will be as indicated on the detail drawings and except as otherwise specified, payment will be made on a unit price basis for piers of the respective types constructed to various heights.

Where poor soil conditions are encountered, the Contractor will be required to construct sub-foundations of Class "C" concrete, spread footings of Class "B" concrete or drive piles for support of piers, headwalls and other structures as directed by the Engineer, payment for which will be made as called for in the Proposal.

(b) Piers for river crossings shall be constructed as shown on the plans. Cross-hatched lines on river crossing plans indicate approximate location of material suitable for pier foundations. The Contractor shall not pour concrete for pier footings until the Engineer has examined the foundation material and given permission for the concrete pour. If, in the opinion of the Engineer, the foundation material is unsuitable, the height of the pier and/or the dimensions of the footing shall be increased as directed, or piling may be ordered as specified below.

Payment for river crossing piers shall be made in accordance with unit prices bid for Class "A" concrete in place for piers and Class "B" concrete in place for pier footings. Unit prices bid for concrete shall include all excavation, coffer dams, dewatering, anchorage and reinforcing steel, form work, pipe straps and all other labor and materials required to construct the piers complete as shown on the plans. Payment for piles, if ordered, will be in accordance with the Proposal. Payment for ductile iron pipe will be in accordance with the lump sum bid in the Proposal.

17.30 Piling: Bearing piles for piers, headwalls and other structures, if required, shall be steel "H" piles with a nominal size of 8" x 8" @ 36 pounds per foot. Structural steel in piles, caps and splices shall be of open-hearth steel conforming to the latest A.S.T.M. Designation A7. The head of each pile shall be capped with a 10" x 10" steel plate 1-inch thick welded to the pile with 5/16 inch fillet weld. The pile head shall be smooth and shall fit the plate snugly.

If splices are necessary they shall be made with 6" x 16" x 1/2" steel splice plates welded with 5/16 inch fillet welds to each flange of the pile. Pile ends shall be separated 1/8 inch and the entire periphery of the pile joint shall then be welded.

The Contractor shall be required at his own expense, to determine the length of piles, required by driving test piles. At Contractor's option test piles may be used as permanent piles in a structure; in which case, the piles shall be of the specified section and of sufficient lengths to cut off at plan grade. No splice in pile will be compensated for unless extra length, in excess of two feet of length as determined by test pile, is required to obtain the minimum bearing value.

Each pile shall be driven to a safe bearing value of ten (10) tons or more with at least ten feet penetration; or shall be driven to refusal in rock; each as directed by the Engineer. The safe bearing shall be determined by one of the Engineering News-Record formulas, as follows:

For drop hammers $R = \frac{2\ WH}{S + 1}$

For single acting hammers

$$R = \frac{2\ WH}{S + 0.1}$$

Where:

R is allowable load in pounds.
W is weight of striking part, lbs.
H is effective height of fall, feet.
S is average penetration of last five blows of approx. equal penetration.

Measurement for payment for steel "H" piling will be for the actual length of the pile from tip to cut-off driven in place to safe bearing and accepted. Payment will be allowed for each splice when extra length is required to obtain minimum bearing as provided heretofore.

17.31 Earth Fill Over Pipes: Where called for on the plans or as otherwise directed by the Engineer, in locations where little or no cover is obtained for sewers, a special earth fill conforming to the details shown in the plans will be placed to provide the necessary protection to the sewer line. Earth used for such fill shall be free from large pieces of rock and shall be carefully placed to avoid damage to the sewer line. It shall be placed in layers around and over the pipe and compacted through the use of hand tools. Earth moving equipment will not be permitted to drive over the line of sewer. Such earth fill will be paid for at the unit price per cubic yard stated in the Proposal. Pay volumes will be determined from cross sections of completed fill in place above the original ground surface. The price bid for this item shall include the cost of obtaining borrow pits.

17.32 Benching: At certain locations where trenches occur on steep hillsides, it is anticipated that more grading will be required than is customary to permit the use of trenching equipment. Where called for on the plans and provided for in the Proposal, payment in addition to prices bid for sewers, will be allowed to cover the cost of such extra work. The grading or benching shall conform with typical sections given on the plans. After the sewer line has been installed and the backfill completed, the "bench" is to be left in place and the "Cut" area shall be dressed. The lump sum bid for this item shall include all costs of extra work in addition to prices bid for sewers which will be measured for payment in trench depths from the plan grade of the "bench" to the grade line of the sewer. The lump sum bid for this item shall include earth fill over sewers where required within limits of benching.

Elsewhere any additional costs for benching shall be included in prices bid for sewers which will be measured for payment for trench depths figured from the original ground profile to the grade line of the sewer.

17.33 Removing and Resetting Fences: At all locations where existing fences must be removed to permit construction of the sewer, the Contractor shall remove such fences and, as the sewer construction progresses, reset the fences in their original location and to their original condition. During actual construction the Contractor shall provide such temporary fencing, or employ other safeguards, as will prevent stock and cattle from wandering to other lands. All costs of removing and resetting fences and such temporary works as may be required shall be included in the prices bid for sewers.

17.34 Channel Excavation: At locations where storm water drainage is obstructed by sewer construction, the Contractor shall excavate new ditches or widen and lower the grade of existing channels in accordance with plans and directions given. Excavation for channels constructed to line and grade as directed

will be measured for payment in its original position by taking original and final cross-sections. The volume will be computed by the average end area method.

17.35 Street Maintenance: Wherever feasible, all streets and roads on which the Contractor is performing work shall be maintained for traffic as directed by the Engineer. A road grader of an approved type shall be available at all times for this maintenance.

17.36 Measurement for Payment: Measurement for payment of sewer lines, size 36-inch and smaller, will be made along the top of the pipe from center to center of manholes less the length of cast iron pipe sewers constructed on piers, in trenches or in tunnels. Measurement for payment for sewer lines, size 42-inch and larger, will be made along the top of the pipe for the actual lengths constructed to the neat inside wall lines of the manholes, excluding the measured length inside walls of manholes and excluding the lengths of cast iron pipe sewers constructed on piers, in trenches, or in tunnels. Cast iron pipe will be measured for payment in accordance with the plan requirements, plus or minus additions or deletions ordered by the Engineer.

Measurement for payment for Class "C" concrete bedding will be made only at locations, and to limits authorized by the Engineer where poor soil conditions are encountered as specified heretofore. Measurement for payment for Class "B" concrete bedding and Class "A" concrete encasement will be made to limits called for on the plans.

Measurement and payment for all other work will be made as shown on the plans or specified herein and as provided for in the proper item in the Proposal.

17.37 Replacing Pavement: Pavement and base course which must be removed for constructing sewers, manholes and all other appurtenances in streets and driveways shall be replaced with the same general class and type of pavement except that all types of base courses removed shall be replaced with a concrete base course. Pavement replaced shall have a minimum bearing on undisturbed earth outside of excavation lines for pipe lines, manholes and other appurtenances of at least six inches.

All backfilling of excavated portions requiring pavement replacement shall be mechanically tamped in 6-inch layers using heavy duty tampers such as pneumatic jack-hammers with tamping foot attachment. Each layer shall be thoroughly tamped to a density equivalent to at least 95% of a modified AASHO T-99-49 Proctor Curve. Further compaction shall be accomplished by leaving the backfilled trench open to traffic while maintaining the surface with crushed stone or gravel. Settlement in trenches shall be refilled with crushed stone or gravel and such maintenance shall continue until replacement of pavement is authorized by the Engineer.

Materials and construction methods for pavement and base course replacement shall conform to applicable provisions of the Standard Specifications of the Georgia State Highway Department as follows:

(a) Concrete Pavement or Base: Concrete pavement and all concrete base courses shall be replaced with Class "A" concrete. The surface finish of the concrete pavement shall conform with that of the existing. The surface of concrete base course shall be left rough, and shall be depressed below finished grade to accommodate the thickness of the specified wearing course. The slab shall be of depth equivalent to the

existing concrete pavement, or base course, but in no case less than 8-inches thick.

(b) Bituminous Surface Treatment: The base course and bituminous surface treatment removed shall be replaced in accordance with the following sections of the Standard Specifications.

1. Concrete Base Course: See (a) above.

2. Surface Treatment: Sections 312, 324A, and 326A
   Asphalt Cement Single Surface Treatment, Type III,
   with Bituminous Seal on primed base.

The finish grade of the surface treatment replaced shall conform with the existing surface. The minimum depth of the base course shall be 8-inches.

(c) Asphalt Pavement: Asphalt pavement and base course removed shall be replaced with a concrete base course and asphalt cement single surface treatment constructed in accordance with (b) above except that the seal or wearing course shall consist of a sand asphalt, or other approved hot plant mix, surface course conforming to Sections 313 and 350 of the Standard Specifications. The sand asphalt mix shall be applied at a rate of not less than 100 pounds per square yard on the tack coated surface treatment. The finish grade and surface texture of the wearing course shall conform with the surface of the existing asphalt pavement.

(d) Replacing of Crushed Stone Surfacing: Crushed stone surfacing removed to permit construction of sewer lines, shall be replaced with crusher-run stone, size 1-1/2" and less, to a compacted depth at least equal to the existing surfacing but not less than 6-inches deep. Construction methods shall conform with Section 300 of the Standard Specification.

(e) Replacing of Topsoil Surfacing: Where sewer lines are constructed on unpaved streets or roads, the topsoil or sandclay surfacing shall be stripped and windrowed separate from the clay excavation from trenches. After the line has been installed and the backfill completed within six inches of the original street grade, the salvaged surfacing shall be replaced. This work shall be considered as general clean up along with the removal of surplus clay excavation materials from the street surface and the restoring of the topsoil surfacing outside trench limits to its original condition; the cost of which shall be included in the price bid for sewers.

17.38 Payment: Quantities of paving, bituminous surface treatment and crushed stone surfacing removed to permit construction of sewers, manholes and appurtenances will be measured for payment in lineal feet along the center of the trench.

The unit prices bid for removing and replacing paving and bituminous surface treatment shall include the cost of removing and replacing the base course.

17.39 Protection of Shrubbery: The Contractor shall generally confine all construction activities to within limits twenty-five (25') feet right and left of centerline of sewer. Any shrubbery, flowering plants and lawns encountered shall be protected and/or removed and replaced to original condition and

location. As many trees as possible shall be preserved in all areas.

All costs for complying with these provisions shall be included in the prices bid for sewers.

17.40 Steel Sheeting: Corrugated steel sheeting where called for on the plans shall be new, continuous, interlocking type fabricated from eight (8) gauge open hearth steel and fully galvanized. The interlock shall be continuous and shall be formed in such a manner so that adjoining sections shall not become disengaged during driving. The sheeting shall be straight and uniform in section and shall be formed with corrugations not more than six (6") inches from crest and not less than two (2") inches deep.

Cast steel driving heads shall be used for driving steel sheeting and shall have a recess conforming to the cross-section of the sheeting. The driving equipment must be capable of applying ample foot-pounds of energy to drive the piling easily and must have low velocity of impact so as not to damage the top of the sheeting. Sections damaged in driving shall be removed and replaced with new sections at the Contractor's expense. Top of sheeting shall either be driven to, or shall be cut off to, a neat line and to elevations as shown on the plans.

ADDENDUM NOTICE NO. ONE

SEWERAGE SYSTEM IMPROVEMENTS

CONTRACT "A"

ATHENS, GEORGIA

Bids Received Until 2:30 P.M., E.S.T., October 25, 1960.

SPECIFICATIONS

Par. 7.10	Extend this paragraph as follows: "All gate valves for water service shall be for 150 pounds working pressure."
Par. 7.11	Change last sentence to read: "Gate valves shall be Mueller, Rensselaer, A. P. Smith, Eddy or Iowa."
Par. 9.09(a)	Selected common brick shall meet A.S.T.M. Specifications C62-50 Grade SW instead of A.S.T.M. Specifications C216 Grade NW as stated.
Par. 12.05(g)	Change first sentence to read: "The panel shall be thoroughly cleaned inside and out after fabrication and given a metal primer coat and two finish coats of A.S.A. 61 gray finish as specified under Section No. 15, "Electrical Work".
Par. 35 Page IB-6	Add: "Water meters shall be City standard and they shall be installed by the Contractor."

PLANS

Sheet No. 4	Manhole at co-ordinates 7 + 77, H + 29.17: Invert on west side of manhole is 598.75 instead of 601.40. Construct drop for sludge bed drain line.
Sheet No. 6	Motor Floor Plan: Butterfly valve at effluent end of venturi tube to be pneumatically operated. Butterfly valve at influent end of venturi tube to be manually operated.
Sheet No. 7	Section C-C: Centerline elevation of 8" final sludge line is 576.71 instead of 587.79 as shown.
Sheet No. 11	Wall Plan, Effluent End: 4" stilling well drain to discharge into Filter No. 1 wall at invert elevation 604.0.
Sheet No. 20	Subway Grating Detail: Subway grating to be aluminum type "B" Kerrigan or equal instead of Borden as stated.
Sheet No. 22	Omit air compressor and tank from raw sewage pump control diagram. Air supply will be furnished from pneumatic control system.

BIDDERS ARE REQUESTED TO ACKNOWLEDGE RECEIPT OF THIS ADDENDUM NOTICE BY RETURNING THE ATTACHED POST CARD.

WIEDEMAN AND SINGLETON
ENGINEERS
ATLANTA, GEORGIA

October 12, 1960

ADDENDUM NOTICE NO. TWO

SEWERAGE SYSTEM IMPROVEMENTS

CONTRACT "A"

ATHENS, GEORGIA

Bids Received Until 2:30 P.M., E.S.T., October 25, 1960.

SPECIFICATIONS

Par. 10.23(a)	Floating covers shall be designed to produce a gas pressure of 5-1/2 to 6 inches of water beneath the cover without ballast and to permit a pressure of at least 10 inches of water beneath the cover with ballast.

DRAWINGS

Sheet 19	Top layer of stone in sludge beds shown as 1/8" to 1/4" should be 1/8" to 3/8".

BIDDERS ARE REQUESTED TO ACKNOWLEDGE RECEIPT OF THIS ADDENDUM NOTICE BY RETURNING THE ATTACHED POST CARD.

WIEDEMAN AND SINGLETON
ENGINEERS
ATLANTA, GEORGIA

October 18, 1960

ADDENDUM NOTICE NO. TWO

SEWERAGE SYSTEM IMPROVEMENTS

CONTRACT "A"

ATHENS, GEORGIA

Bids Received Until 2:30 P.M., E.S.T., October 25, 1960.

SPECIFICATIONS

Par. 10.23(a)	Floating covers shall be designed to produce a gas pressure of 5-1/2 to 6 inches of water beneath the cover without ballast and to permit a pressure of at least 10 inches of water beneath the cover with ballast.

DRAWINGS

Sheet 19	Top layer of stone in sludge beds shown as 1/8" to 1/4" should be 1/8" to 3/8".

BIDDERS ARE REQUESTED TO ACKNOWLEDGE RECEIPT OF THIS ADDENDUM NOTICE BY RETURNING THE ATTACHED POST CARD.

WIEDEMAN AND SINGLETON
ENGINEERS
ATLANTA, GEORGIA

October 18, 1960

U.S. POSTAGE 3¢
IN GOD WE TRUST
LIBERTY

THIS SIDE OF CARD IS FOR ADDRESS

WIEDEMAN & SINGLETON

P. O. Box 1878

Atlanta 1, Georgia

Date...

THIS IS TO ACKNOWLEDGE RECEIPT OF ADDENDUM NO. 2, ON SEWERAGE SYSTEM IMPROVEMENTS CONTRACT "A" FOR THE CITY OF ATHENS, GEORGIA.

....

By:...